WHERE ENTREPRENEURSHIP AND FINANCE MEET: STARTUP VALUATION AND ACQUISITION IN THE VENTURE CAPITAL AND CORPORATE CONTEXT

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Submitted by Andreas Köhn

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Supervisor: Univ.-Prof. Dr. Andreas Kuckertz

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Faculty Dean:	Univ.-Prof. Dr. Karsten Hadwich
Supervisor:	Univ.-Prof. Dr. Andreas Kuckertz
Second Reviewer:	Univ.-Prof. Dr. Hans-Peter Burghof

"The future is not some place we are going to, but one we are creating. The paths are not to be found, but made, and the activity of making them, changes both the maker and the destination."

—John H. Shaar—

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Table of contents

1 Introduction 1

1.1 Startup valuation and exit as integral parts of the entrepreneurial process 2

1.2 Motivation and scope of this dissertation 4

1.3 Structure of this dissertation 5

2 The determinants of startup valuation in the venture capital context: A systematic review and avenues for future research 10

2.1 Introduction 10

2.2 Review approach 11

2.3 Toward an integrative framework 26

2.3.1 Determinants related to startups 28

2.3.2 Determinants related to VCs 33

2.3.3 Determinants related to the external environment 38

2.4 Discussion 40

2.5 Limitations 44

2.6 Conclusion 44

3 Exploring the differences in early-stage startup valuation across countries: An institutional perspective 46

3.1 Introduction 46

3.2 Linking institutional theory and startup valuation 48

3.2.1 Formal institutions and startup valuation 49

3.2.2 Informal institutions and startup valuation 50

3.2.3 Innovativeness and startup valuation 52

3.3 Methods 53

3.3.1 Analytical approach 53

3.3.2 Sample and outcomes 54

3.3.3 Causal conditions 55
3.4 Results 57
3.5 Discussion 60
3.5.1 Implications 60
3.5.2 Limitations and future research 62
3.6 Conclusion 63

4 A world of difference? The impact of corporate venture capitalists' investment motivation on startup valuation 64
4.1 Introduction 64
4.2 Literature review and motivation 66
4.3 Exploring CVCs' investment motivation 68
4.3.1 Data and sample design 68
4.3.2 Capturing investment motivation through CATA 70
4.3.3 Clustering CVCs based on their investment motivation 73
4.4 Validating the identified clusters: CVCs' investment motivation and startup valuation 75
4.4.1 Theoretical development and hypotheses 77
4.4.2 Measures and descriptive statistics 79
4.4.3 Method of analysis 82
4.4.4 Results 86
4.5 Discussion 90
4.5.1 Theoretical and practical implications 90
4.5.2 Limitations and avenues for future research 91
4.6 Conclusion 93

5 From investment to acquisition: The impact of exploration and exploitation on CVC acquisition 94

5.1 Introduction 94

5.2 Theory and hypotheses 96

5.2.1 CVC 96

5.2.2 Exploration and exploitation in the context of CVC acquisition 98

5.2.3 The moderating role of product market relatedness 100

5.3 Methodology 101

5.3.1 Sample and data 101

5.3.2 Measures 103

5.4 Results 107

5.5 Discussion 111

5.6 Limitations and paths for future research 113

5.7 Conclusion 114

6 Conclusion 115

6.1 Summary of findings and contributions 115

6.2 Paths for future research 119

6.3 Final thoughts 122

7 References 123

1 Introduction

The emergence and dominance of the ride-hailing startup Uber, which achieved a valuation of almost USD 70 billion in less than a decade highlights that we are living in a time of what Schumpeter (1943) coined 'creative destruction' (Dudley, Banister, & Schwanen, 2017; Perry, 2015). To put Uber's valuation into context, it is greater than the market capitalizations of many long-established automobile industry stalwarts, such as General Motors with its more than one-hundred year history (Chen, 2015; The Economist, 2016). Schumpeter saw the entrepreneur as a visionary (Kenney, 1986) who explores and exploits opportunities that have the potential to revamp entire industries (Burgelman & Grove, 2007).[1] Intriguingly, venture capitalists (VCs) have backed and still back many startups that have revamped whole industries; a list that includes Apple, Genentech, and Microsoft (Florida & Kenney, 1988; Gompers & Lerner, 1998), as well as the current crop of startups of the likes of Uber and Airbnb (The Economist, 2015). This shows that so-called Schumpeterian entrepreneurs often rely on the financial resources provided by VCs to nurture and exploit their innovative ideas (Block, Fisch, & van Praag, 2017; Florida & Kenney, 1988; Kenney, 1986; Kuckertz, Kollmann, Röhm, and Middelberg, 2015). In doing so, as part of the venture capital (VC) investment and therewith entrepreneurial process (De Clercq, Fried, Oskari, & Sapienza, 2006; Tyebjee & Bruno, 1984), entrepreneurs seeking VC funding necessarily have to deal with the valuation and ultimately the exit of their startups. Accordingly, the goal of this dissertation is to scrutinize the determinants underlying startup valuations and to study the factors comprising the entrepreneurial exit in the VC context, focusing for the latter on startup acquisitions by parent companies that funded startups through their corporate venture capital (CVC) units.

To provide the groundwork for this dissertation, the remainder of this introduction is structured as follows: Section 1.1 outlines the roles of startup valuation and exit in the VC investment and entrepreneurial process, and thus provides a framing for the dissertation's studies. Section 1.2 sets out the motivation and the scope of this dissertation. In Section 1.3 the dissertation's structure is presented.

[1] In view of this, Schumpeterian entrepreneurship accords with the entrepreneurship definition of Kuckertz and Mandl (2016), in that it focuses on a growth-oriented creation process, thereby excluding what are termed mom and pop businesses (e.g., Kollmann & Kuckertz, 2010). Indeed, Shane (2009) argues that policy makers should focus on those high-growth startups to promote economic growth.

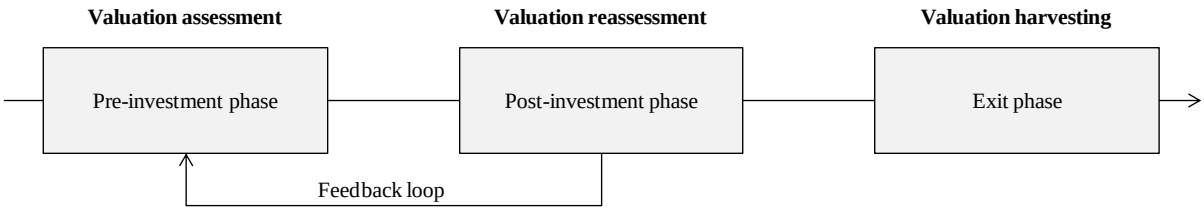
1.1 Startup valuation and exit as integral parts of the entrepreneurial process

Schumpeter (1934) distinguished between the roles of the entrepreneur and the capitalist, stating: "The entrepreneur is never the risk bearer. […] The one who gives credit comes to grief if the undertaking fails" (p. 137). Undoubtedly in today's world, VCs and their investors play a crucial role in providing capital and bearing a major part of the economic risk underlying innovative entrepreneurship (Bertocco, 2008; Kenney, 1986).

In general, VCs—in contrast to traditional banks—invest equity to acquire a share in a startup, and seek to generate a return on their illiquid investment by successfully exiting on the acquired share in the future (e.g., Florida & Kenney, 1988; Kollmann & Kuckertz, 2006; Tyebjee & Bruno, 1984). Since VCs and entrepreneurs need to determine the amount of equity that is invested, they have to decide on the valuation of the startup (Cumming & Dai, 2011; Hsu, 2004; Miloud, Aspelund, & Cabrol, 2012). In turn, valuation and exit are integral parts of the relationship governing VCs and entrepreneurs (e.g., De Clercq et al., 2006; Wright & Robbie, 1998). In this regard, the seminal work of Tyebjee and Bruno (1984) conceptualizing the VC investment process by dividing it into sequential steps provides a perfect understanding of this entrepreneurial process. Essentially, from an entrepreneur's point of view, the VC investment process can be divided into three phases: the pre-investment, post-investment, and exit phase (De Clercq et al., 2006; Meglio, Mocciaro Li Destri, & Capasso, 2017; Tyebjee & Bruno, 1984).[2] The goal of this dissertation is to shed light on the factors determining the valuations of startups and entrepreneurial exit in the VC context, and accordingly references to these phases are complemented by their respective valuation perspective; that is, (i) valuation assessment, (ii) valuation reassessment, and (iii) valuation harvesting. Entrepreneurs seeking VC are concerned with the entire process. Figure 1 depicts the VC investment process and the central aspects of each phase are outlined below.

[2] It should be noted that before independent VCs can actually invest in startups, they need to raise funds from other investors such as pension funds or funds of funds, who then become so-called limited partners in the VC fund (e.g., Gompers & Lerner, 1998; Kollmann, Kuckertz, & Middelberg, 2014; Kuckertz et al., 2015).

Figure 1: VC investment process from a valuation perspective (adapted from De Clercq et al., 2006)



In the first phase, VCs identify prospective startup investments, carefully screen and evaluate them (Tyebjee & Bruno, 1984). After the VCs have identified their preferred startup investments, they have to structure the deal, and above all, have to agree upon a valuation with the entrepreneurs, upon which the investment will be based (e.g., De Clercq et al., 2006; Tyebjee & Bruno, 1984).[3] The valuation of a startup is therefore key for both entrepreneurs and VCs. For VCs, their return at an exit event like an IPO or acquisition hinges upon the difference between the exit valuation and the previous valuations at which they invested. For entrepreneurs, the valuation determines how much share of their startup they have to give away to receive a given amount of capital, and therefore directly affects the control of their venture (Cumming & Dai, 2011; Hsu, 2004; Miloud et al., 2012). Accordingly, the valuation provides the basis for the financial resources available to entrepreneurs to draw upon to exploit their innovative ideas.

In the second phase, VCs monitor and support the entrepreneurs to ensure they can foster and exploit their innovative ideas (De Clercq et al., 2006). In that sense, VCs act as collaborators (Tyebjee & Bruno, 1984), for instance, by helping to recruit management personnel or to provide strategic guidance (e.g., Gorman & Sahlman, 1989). To reduce the underlying economic risk, VC-backed startups are typically financed over multiple investment rounds (e.g., Sahlman, 1990; Tennert, Lambert, & Burghof, 2017). Accordingly, each new investment round requires a reassessment of the previous valuation of the startup, which illustrates that startup valuations are dynamic and change over time (De Clercq et al., 2006; Gompers, 1995). Consequently, the outlined process necessarily comprises an ongoing reassessment of the previous valuation due to the staging of investment, which adds a feedback loop to the latter stage of the first phase, meaning entrepreneurs and VCs have to negotiate the

[3] It should be noted that only a single-digit percentage number of the overall deals received are actually realized by VCs (Petty and Gruber, 2011). This underscores that VCs diligently search for startups with strong potential and illustrates the close relationship between innovative entrepreneurship and VC.

valuation of each new financing round (e.g., Gompers, 1995). Generally, three types of valuation reassessment are distinguished. When a startup is performing as expected, its valuation is likely to appreciate, leading to what the industry refers to as an *up round* in the subsequent financing round. When a startup's performance does not meet the investors' expectations, its previous valuation is likely to be adjusted downward, leading to a *down round*. When the valuation of the previous round equals that of the new round, this is called a *flat round* (e.g., Broughman & Fried, 2012).

In the third phase, VCs seek to exit their startup investment by turning their illiquid equity share in the startup into liquidity (e.g., Kollmann & Kuckertz, 2006; Kraus & Burghof, 2003; Tyebjee & Bruno, 1984). This is usually done two to seven years after the initial investment through an IPO, acquisition, buyback, or secondary sale. The first two are the preferred forms of exit because they generally produce the highest returns (Cumming & Johan, 2008; Cumming & MacIntosh, 2000). Accordingly, in their typology of exit types, DeTienne, McKelvie, and Chandler (2015) consider IPO and acquisition as financial harvest, and interestingly find that this type of exit is positively associated with entrepreneurs deeming their idea radically innovative. Moreover, it has to be noted that since some startups will fail, liquidation is an unwanted means of exit because it usually results in a loss of investment for VCs and their investors (De Clercq et al., 2006).

In short, because entrepreneurs might not have enough capital to fund their innovative ideas, they often draw on VC (e.g., Florida & Kenney, 1988; Gompers & Lerner, 1998; Kenney, 1986). That said, when entrepreneurs engage with VCs, it is important for them to understand the VC investment process which can be divided into three different phases underscoring that both valuation and exit are crucial parts of the entrepreneurial process.

1.2 Motivation and scope of this dissertation

As outlined in the previous section, valuation and exit are integral parts of the entrepreneurial process when entrepreneurs rely on VC to fund their innovative ideas. Surprisingly, however, despite their relevance there is little research on the determinants underlying startup valuations (Cumming & Dai, 2011; Zheng, Liu, & George, 2010) and exit (e.g., DeTienne, 2010; DeTienne et al., 2015), particularly as applicable to startup acquisitions (Andersson &

Xiao, 2016). Accordingly, acquiring a more thorough understanding of these two research topics is very important.

In sum, this dissertation focuses on the valuation and acquisition determinants of startups in the VC context, with a special focus on CVC. On a broad and general level, the VC market is shaped by three players, namely entrepreneurs, independent VCs (IVCs), and corporate venture capitalists (CVCs) (Dushnitsky & Shaver, 2009). In view of this and to put the focus on CVCs within this dissertation into perspective, it should be remarked that researchers seem to have largely overlooked the role CVCs play in the process outlined in Figure 1. Nevertheless, studying the role of CVCs in this process is particularly interesting because the group differs from IVCs in terms of their value-adding contributions (Maula, Autio, & Murray, 2005); and because CVCs might invest so that their parent organizations can ultimately acquire a startup (Benson & Ziedonis, 2010; Kaji & Peltz-Zatulove, 2015; Siegel, Siegel, & MacMillan, 1988). Owing to this special role in the VC market, this dissertation particularly focuses on studying the impact of CVCs on startup valuations as well as on the factors that lead to CVC acquisitions, that is, startup acquisitions by the parent company of a CVC arm that has previously invested in the acquired startup (Benson & Ziedonis, 2010). Indeed, Kaji and Peltz-Zatulove (2015) recently surveyed CVCs and identified that CVCs differ in their strategic and financial investment motivation, and that some CVCs also invest in startups to create an early link with potential acquisition targets. Intriguingly, the recent acquisition by Caterpillar of Yard Club, a digital marketplace for construction equipment, which has received previous funding through Caterpillar's CVC unit nicely underscores this last option (Lawler, 2017).

As a whole, this dissertation is motivated by advancing the understanding of the determinants underlying startup valuations and acquisitions in the VC context and by seeking to at least partially fill the research gaps in these areas by putting a special focus on CVCs.

1.3 Structure of this dissertation

To deliver its research goals, this dissertation includes one systematic literature review and three empirical studies seeking to further the understanding of the determinants that affect startup valuations, and the factors driving entrepreneurial exit in terms of startup acquisitions in the VC context (see Table 1 for an overview of the presented studies). Table 1 also records

the analytical methods applied in this dissertation comprising fuzzy-set qualitative comparative analysis (fsQCA), computer-aided text analysis (CATA), cluster analysis, hierarchical linear modeling (HLM), and logistic regression. The dissertation also references a broad range of academic literature. The following paragraphs outline each study's research scope and key findings.

The first study is presented in Chapter 2, and is titled "*The determinants of startup valuation in the venture capital context: A systematic review and avenues for future research*" (Köhn, 2018). The article reports on a systematic literature review undertaken to gather and analyze empirical research on the determinants of startup valuations in the VC context. To acquire an overview of empirically supported determinants, this study is guided by the research question: Which determinants affect startup valuations in the VC context? The article sets out the current position in the extant literature to extend scholars' understanding of the determinants underlying startup valuations in the VC context. Accordingly, the paper can be regarded as a first step toward addressing the critiques of, among others, Cumming and Dai (2011) and Zheng et al. (2010). Furthermore, the study develops an integrative framework to organize the scrutinized determinants in 58 selected empirical papers and discusses paths for future research that could contribute to a more comprehensive understanding of the topic. Doing so is also critically important for this dissertation because the process helped to identify and define the research scope and addressable research questions of the subsequent studies within this thesis. Overall, this study establishes an overview of the determinants of startup valuation in the VC context from a broad and general perspective by developing an integrative framework.

Table 1: Overview of the studies included in this dissertation

Chapter	Study	Research question	Country	Sample size	Sample period	Analytical method
2	*The determinants of startup valuation in the venture capital context: A systematic review and avenues for future research*	Which determinants affect startup valuations in the VC context?	International	58 empirical papers	1994–2016	Systematic literature review
3	*Exploring the differences in early-stage startup valuation across countries: An institutional perspective*	Which combinations of legal origin and culture in conjunction with a country's innovativeness explain high startup valuations across countries?	International	13 countries composed of 1,251 startup valuations	2009–2016	fsQCA
4	*A world of difference? The impact of corporate venture capitalists' investment motivation on startup valuation*	(i) What are the different types of CVCs' investment motivation? (ii) How does CVCs' investment motivation impact startup valuations?	US	52 CVCs and 147 startups	2009–2016	CATA, cluster analysis, HLM
5	*From investment to acquisition: The impact of exploration and exploitation on CVC acquisition*	What is the effect of a corporate mother's degree of explorative and exploitative orientation on CVC acquisition?	US	901 startup acquisitions with CVC funding (representing 124 CVC acquisitions)	1996–2016	CATA, logistic regression

The second study is presented in Chapter 3 and is titled "*Exploring the differences in early-stage startup valuation across countries: An institutional perspective*". It builds on the findings of the literature review in Chapter 2 by drawing on the developed integrative framework and the avenues for future research outlined therein that focus on the valuation determinants of the external environment. That said, the second study relies on institutional theory to examine the variability of early-stage startup valuations across countries, thereby seeking to answer the research question: Which combinations of legal origin and culture in conjunction with a country's innovativeness explain high startup valuations across countries? To address this research question, the study explores a dataset of 1,251 early-stage startup valuations from 13 countries made between 2009 and 2016, and applies fsQCA. The fsQCA approach was originally developed by Ragin (1987, 2000, 2008) and is an emerging research method in the field of entrepreneurship (e.g., Kraus, Ribeiro-Soriano, & Schüssler, 2018). It is particularly suited to studying the underlying factors of across-country differences because it accounts for the causal asymmetry, conjunctural causation, and equifinality inherent in such comparisons (Berger, 2016). The findings of the study underline that a country's legal origin, culture, and innovativeness in combination are important determinants of startup valuations in the VC context.

The third study is titled "*A world of difference? The impact of corporate venture capitalists' investment motivation on startup valuation*" (Röhm, Köhn, Kuckertz, & Dehnen, 2018), and is presented in Chapter 4. This article also capitalizes on the integrative framework developed in Chapter 2 by moving the focus regarding the factors determining startup valuations in the VC context from the level of the external environment to that of the VC investor. In this regard, Heughebaert and Manigart (2012) show that the type of VC firm has a significant impact on startup valuations. Intriguingly, as discussed in the first study of this dissertation, the impact of CVCs on startup valuations has not been studied sufficiently. Although it is well established that CVCs differ in their investment motivation, current research is rather dominated by a black and white approach differentiating between CVCs pursuing strategic and financial investment motivations, but at the same time appears to struggle to clearly classify CVCs into either of the two groups (see, for example, Dushnitsky & Lenox, 2006). Therefore, the underlying purpose of this study is twofold and is guided by the following research questions: (i) What are the different types of CVCs' investment motivation? and (ii) how does CVCs' investment motivation impact startup valuations? To tackle these research questions, the study follows a rigorous research strategy combining explorative and theory-

testing approaches by drawing on a sample of 52 CVCs and their respective 147 startup valuations made between January 2009 and January 2016. The explorative part of the study identifies four types of CVCs' investment motivation, namely *strategic*, *financial*, *analytic*, and *unfocused*. The theory-testing section then shows that CVCs' investment motivation impacts the startup valuations they assign.

The fourth study is titled "*From investment to acquisition: The impact of exploration and exploitation on CVC acquisition*" and is presented in Chapter 5. It is a development of the study presented in Chapter 4 and examines the impact of a corporate mother's degree of explorative and exploitative orientation on CVC acquisitions. The study moves on to the exit phase of the entrepreneurial process described in Figure 1, and seeks to address the criticism of the paucity of research on the determinants underlying entrepreneurial exit in general (e.g., DeTienne, 2010; DeTienne et al., 2015), and on the acquisition of startups in particular (Andersson & Xiao, 2016). It does so by focusing on the use of CVC as a means to scout promising acquisition targets (Benson & Ziedonis, 2010; Kaji & Peltz-Zatulove, 2015; Siegel et al., 1988). The study is guided by the research question: What is the effect of a corporate mother's degree of explorative and exploitative orientation on CVC acquisition? To address this research question, the study applies CATA and logistic regression analysis for a sample of 901 acquisitions of startups that have received CVC funding; of which 124 were CVC acquisitions. In sum, the study's findings show that the explorative and exploitative orientation of a corporate mother affects the likelihood of a CVC acquisition, and that this effect is moderated by the degree of product market relatedness between corporate mother and startup.

Chapter 6 closes this dissertation with a summary of each study's main findings and their contributions as well as the dissertation's overall contributions to the field of entrepreneurial finance. In addition, an outlook on how to further advance the research topics of startup valuations and acquisitions in the VC context, and some final thoughts are provided.

2 The determinants of startup valuation in the venture capital context: A systematic review and avenues for future research[4]

Abstract

Startup valuation in the VC context is often said to be more art than science. In view of this, it is particularly important to be aware of and understand the different underlying determinants that affect the valuation of startups. This paper conducts a systematic review of the existing empirical literature to illustrate the determinants of startup valuations in the VC context. Beyond that, the paper seeks to provide an organizing structure to the current literature as well as to detect academic voids and directions for future research. To achieve these goals, it develops an integrative framework for the factors determining startup valuations in the VC environment, which should be of use to both practitioners and researchers. That framework illustrates how startup valuations in the VC context are shaped by a three-sided interplay of factors related to startups, VCs, and the external environment.

2.1 Introduction

> There are fewer topics more cloaked in mystery, black magic and aspiration than [startup] valuation. People regularly speak of inflated valuations—or insane valuations—but it is difficult to know what anchors the numbers (Vetter, 2016)

The Wall Street Journal reports that as of September 2016 there were 150 unicorns, which are private venture-backed firms with a valuation of at least one billion US dollars. Compared to the 45 unicorns reported in January 2014 this implies a staggering growth of over 200% in less than three years (Austin, Canipe, & Slobin, 2016). In light of this unicorn craze, it is unsurprising that the US Securities and Exchange Commission has recently become interested in the valuation practices applied by mutual funds to startups (Grind, 2015). Evidently, there is a great need for both regulators and other relevant parties to encourage a comprehensive understanding of the determinants that impact the valuations of startups in the VC context. In addition to its importance to regulators and policymakers, the valuation of

[4] This study is published with the kind permission of Springer Nature. The original publication Köhn (2018) appeared in: *Management Review Quarterly*, Vol. 68, Issue 1, pp. 3-36, which can be found at the following address https://doi.org/10.1007/s11301-017-0131-5.

startups in the VC context is of utmost importance to VCs, entrepreneurs, and fund investors alike. While for entrepreneurs the valuation specifies how many shares, and hence control rights, they hold in their venture after an investment round, the VCs' returns, and in turn those of their fund investors, are contingent upon the difference between the valuations they invested in a startup and the final proceeds they can achieve at an exit event such as an IPO or acquisition (Cumming & Dai, 2011; Hsu, 2004; Zheng et al., 2010).

Notwithstanding the current demand by regulators for improved insight into the valuation of VC-backed startups, in academia—due to the domain's significance—there has been ongoing criticism about the paucity of and explicit calls for further research on the determinants affecting startup valuations (Cumming & Dai, 2011; Wright & Robbie, 1998; Zheng et al., 2010). Existing literature is not only scarce but also very fragmented, and lacks a conceptual framework integrating the existing empirical research on the determinants that impact the valuation of startups in the VC market. This paper therefore aims to contribute to the literature on the determinants of startup valuations in the VC context in several ways. First, it identifies, collates, and reviews relevant empirical articles. Second, it integrates the selected articles into a conceptual framework to provide an organizing structure to the extant literature. Third, the systematic review and the framework help to detect academic voids and directions for future research.

To achieve these objectives, the paper is organized as follows: Section 2.2 describes the review approach and the state of the literature. Building on this, Section 2.3 outlines a framework providing a systematic structure to the extant literature and presents the review's findings. Section 2.4, discusses the paper's main findings and illustrates avenues for future research. Section 2.5 addresses the paper's limitations, and Section 2.6 concludes.

2.2 Review approach

Assigning a valuation to a startup in the VC context is remarkably challenging because startup investments are characterized by high risk, high cash burn rates, and asymmetric information (Sahlman, 1990; Sievers, Mokwa, & Keienburg, 2013). In view of this, it is all the more important to understand the different determinants that impact startup valuations. Hence, a structured literature review of the determinants of startup valuation in the VC context was performed to ensure the findings are systematic, transparent, and replicable

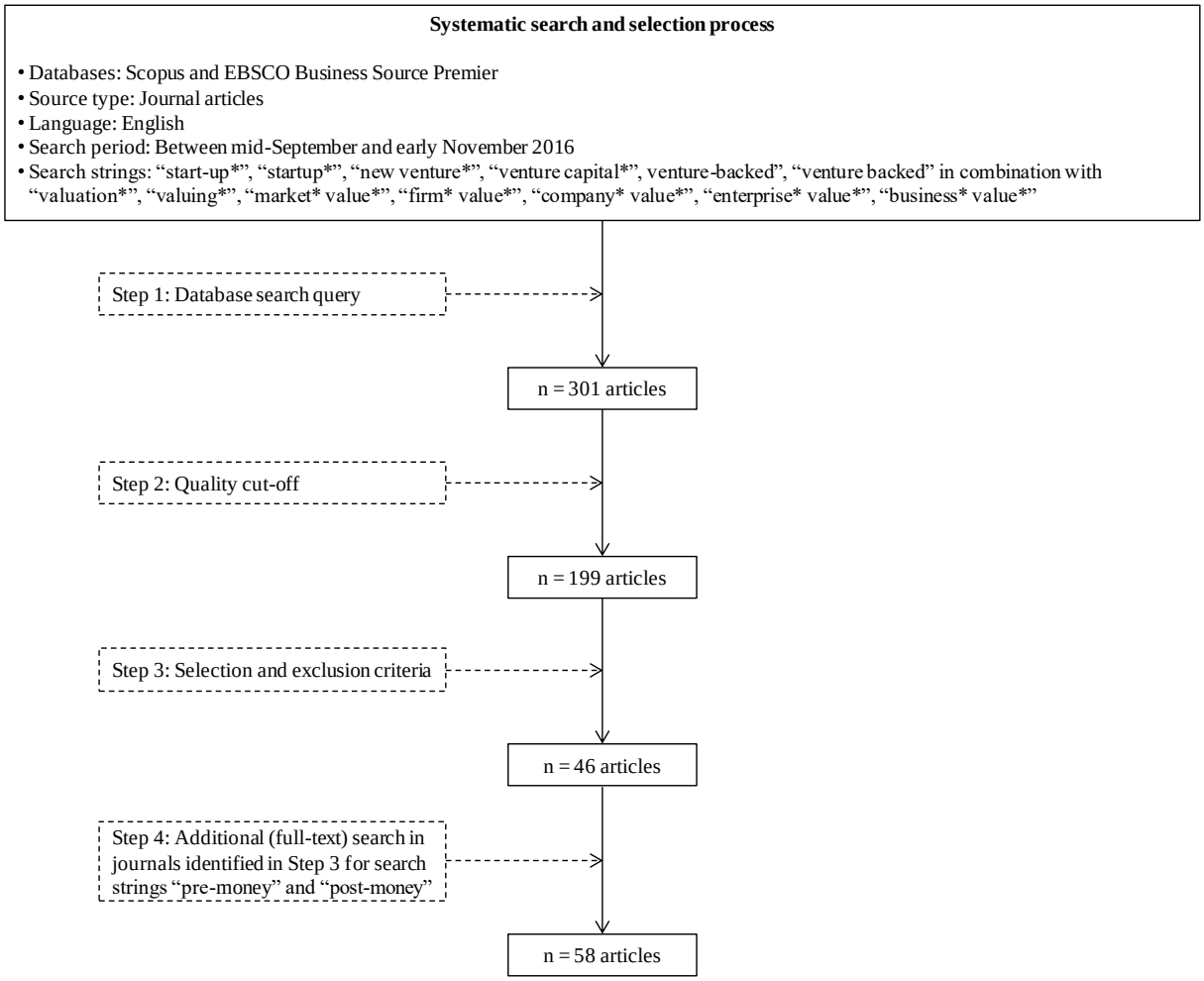
(Tranfield, Denyer, & Smart, 2003). It should be noted that rigorously conducted structured literature reviews are a powerful means to provide a systematic overview of research on a particular subject (Rousseau & McCarthy, 2007). To the best of the author's knowledge, this paper is the first systematic literature review that considers the determinants of startup valuation within the VC environment holistically.

Article focus. To review the literature on the determinants of startup valuations in the VC context a systematic search was conducted between mid-September and early November 2016. The focus of this literature review is on English-language journal articles because such journal articles are regarded as established knowledge and have the greatest influence on the academic discourse (Keupp, Palmié, & Gassmann, 2012; Podsakoff, MacKenzie, Bachrach, & Podsakoff, 2005). In addition, this review follows previous literature reviews in focusing on empirical research (e.g., Hueske & Guenther, 2015; Klotz, Hmieleski, Bradley, & Busenitz, 2014; Narayanan, Yang, & Zahra, 2009) as the paper's overarching goal is to identify and synthesize the knowledge about empirically proven factors determining startup valuations in the VC context.

Article identification and selection. The identification of articles involved a four-step process (see Figure 2 for a summary of the systematic search and selection process). The first step involved searching the Scopus and EBSCO Business Source Premier databases for the words "start-up*", "startup*", "new venture*", "venture capital*", venture-backed" and "venture backed" in combination with the terms "valuation*", "valuing*", "market* value*", "firm* value*", "company* value*", "enterprise* value*" or "business* value*" in an article's title, abstract, or keywords, and in the case of the EBSCO Business Source Premier, also in the subject terms.[5] For Scopus, the search was further focused on the subject areas of "Business, Management and Accounting", "Economics, Econometrics and Finance" and "Decision Sciences". Excluding double counts, the first step produced an initial sample of 301 articles. In the second step, a quality cut-off was applied to guarantee journal quality as in previous literature reviews (e.g., Bouncken, Gast, Kraus, & Bogers, 2015; Falkner & Hiebl, 2015).

[5] The latter group of search strings was derived based on Zheng et al. (2010) considering a startup's valuation as the estimate of its market value.

Figure 2: Systematic search and selection process



For journals included in Scopus, that quality cut-off was based on the SCImago Journal Rank (SJR) 2015, and the lowest quartile of the identified journals (SJR ≤ .337) was excluded.[6] For journals that were not assigned an SJR score, the cut-off criteria of Bouncken et al. (2015) based on Thomson Reuters Journal Citation Reports (JCR) 2015 (i.e., a JCR Impact Factor < .7) were applied. Journals that had neither an SJR nor a JCR score were excluded. This narrowed the sample to 199 articles. In the third step, all papers were diligently reviewed and only empirical articles examining a startup's financial valuation or a variation of it (e.g., average share price or change in valuation over successive financing rounds) and papers that scrutinized the valuation methodologies relevant to VCs were retained. The exclusion criteria

[6] For discontinued journals the latest available score was applied. It must be acknowledged that the applied cut-off criteria is not free of criticism. However, to the best of the author's knowledge there are no systematic literature reviews suggesting a reasonable quality cut-off for the Scopus relevant SJR. Therefore, it was considered appropriate to cut off the journals within the lowest quartile based on the SJR metric. Additionally, to benchmark the cut-off criteria, they were compared with journals that are assigned a JCR Impact Factor as this allowed the author to rely on the threshold suggested by Bouncken et al. (2015) (JCR Impact Factor < .7). The comparison indicated that the derived Scopus specific threshold is reasonable.

encompassed non-empirical papers, and articles that neither focused on the financial valuation of startups nor on relevant valuation methodologies. To give an example, articles that employed the financial valuation of a startup merely as a control variable for a startup's quality were excluded. Similarly, articles solely referring to public, angel-backed, social, or family firms were excluded because startups in the VC context are typically considered to be private young growth-oriented ventures (Kollmann & Kuckertz, 2010; Morris, Schindehutte, & Allen, 2005). Articles exclusively considering the valuation of startups at an exit event (e.g., IPO or acquisition) were also excluded. The reason for this is that an exit event is regarded as the financial harvesting based on previous valuations of a startup representing a separate and special event in the entrepreneurial process (e.g., Petty, Shulman, & Bygrave, 1994). In this regard, the choice of the exit mechanism and therewith the ultimate valuation at which a startup can be financially harvested is likely driven by different factors (Bayar & Chemmanur, 2011). Indeed, the valuation at an IPO marks the first time when a startup is valued by public market investors (Aggarwal, Bhagat, & Rangan, 2009) who might rely on different valuation determinants than potential acquirers (Bayar & Chemmanur, 2011) and the VCs in the previous private financing rounds (Zheng et al., 2010). Consequently, to avert the risk that the determinants underlying the valuation at an exit event differ from the ones in the pre-exit phase, it is avoided that this could bias the paper's analysis. Furthermore, five articles were excluded because they did not provide sufficient information on the underlying data, lacked necessary data,[7] or because their scope was too limited. In sum, the identification process to this point yielded 46 articles. In the fourth step, to ensure the comprehensive identification of relevant papers, an additional search (of the full-text, whenever possible) of the identified journals hosting the 46 selected articles was conducted. The additional search focused on the search strings "pre-money" and "post-money",[8] because these terms are common VC jargon in the context of startup valuations (e.g., Korteweg & Sorensen, 2010; Sorensen, 2007). The extended inclusion criteria meant 12 articles were added (see Table 2 for an illustrative example).

[7] One article only provided summary statistics on valuation and stated that owing to the lack of a complete set of variables, valuation was not considered in the subsequent analysis.

[8] It should be mentioned that in the initial search (first step), the terms "pre-money" and "post-money" were covered by the search word "valuation*" because in the VC jargon one speaks of pre-money valuation and post-money valuation. Furthermore, the additional search (fourth step) targeted undetected papers within the identified journals, including whenever possible a full-text search. Consequently, to guarantee a goal-oriented and efficient full-text search through the additional search, it was specifically searched for the search strings "pre-money" and "post-money" because they are inherently linked to startup valuations in the VC context.

Table 2: Illustrative example elucidating the search process

Initial search	Search strings	"start-up*", "startup*", "new venture*", "venture capital*", venture-backed", "venture backed" in combination with "valuation*", "valuing*", "market* value*", "firm* value*", "company* value*", "enterprise* value*", "business* value*"	
	Search type	English journal articles listed in Scopus and EBSCO Business Source Premier	
	Search field	Example – Bengtsson and Hsu (2015)	Identification
	Title	Ethnic matching in the U.S. venture capital market	No
	Abstract	We document the role of entrepreneurial founder and venture capital (VC) partner co-ethnicity in shaping investment relationships. Co-ethnicity increases the likelihood that a VC firm invests in a company. Conditional on investment, co-ethnicity strengthens the degree of involvement by raising the likelihood of VC board of director involvement and increasing the size and scope of investment. These results are consistent with trust and social-network based mechanisms. Shared ethnicity in our sample is associated with worse investment outcomes as measured by investment liquidity, however, which our results suggest might stem from looser screening and/or corporate governance	No
	Keywords	venture capital, ethnic matching	No
	Subject terms	venture capital, capital market, investments, liquidity (economics), boards of directors	No
Additional search	Search strings	"pre-money", "post-money"	
	Search type	All journals identified in Step 3	
	Search field	Example – Bengtsson and Hsu (2015)	Identification
	Full-text	We find that the VC firm obtained higher *pre-money* valuations when its partner(s) had an ethnic tie with the company's founder(s) […]	Yes

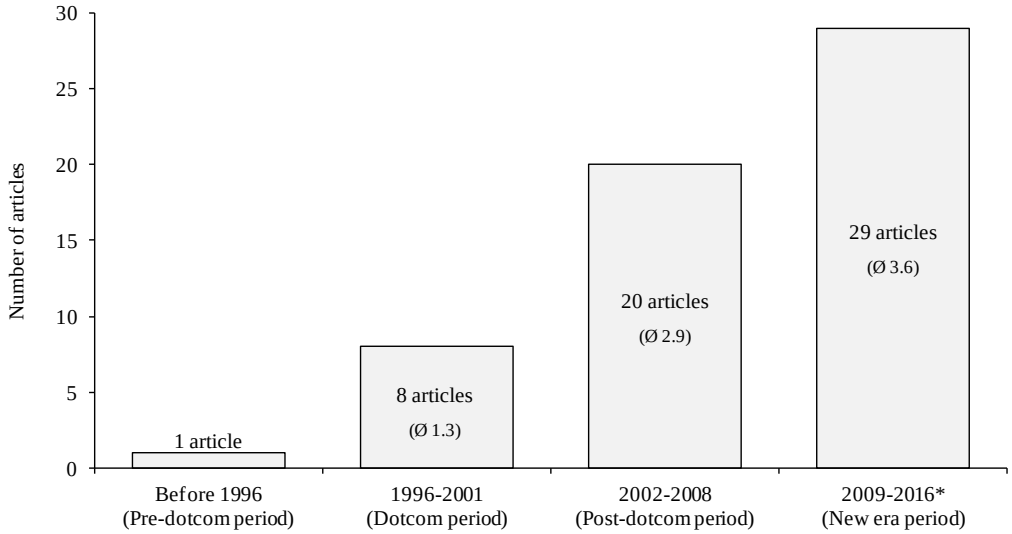
In total, the final sample consists of 58 papers.[9] The final number of 58 articles appears to be a reasonable sample size, comparing favorably to those used in the research of Klotz et al. (2014), Schroll and Mild (2012), and Thywissen (2015), for example.

Overview of the selected articles. The empirical literature on the determinants of startup valuations in the VC context grew significantly in volume since the dotcom period (see Figure 3). Twenty of the selected articles were published between 2002 and 2008 while only eight appeared in the preceding dotcom period from 1996 to 2001. Intriguingly, 29 articles (50% of the selected papers), stem from the period following the economic crisis in 2008. Although the number of publications fluctuates annually, the overall volume of papers dealing

[9] A few of the selected papers used pooled samples of private and public valuations. However, it is not expected that the results would be much different on a disaggregated level. For instance, Aggarwal and Hsu (2009) stated that their results were widely consistent on the disaggregated level.

with the topic shows a clear growth. This is underpinned by the average number of publications of the selected articles annually, which increased since the dotcom period from 1.3 to 3.6 average publications per year. A possible reason for the publication pattern could be the aftermath of the dotcom bubble triggering scholars' interest in startup valuations, and the subsequent emergence of new forms of startups exemplified by Uber and Airbnb that became unicorns after the economic crisis in 2008 (The Economist, 2015).

Figure 3: Overview of selected articles over time (1994–2016)



* 2016 not fully covered. In parentheses number of average articles per year for respective time period.

The analysis of the final selection of 58 papers reveals that all but three of them adopt a quantitative approach, mainly by applying regression based analysis (see Table 3). In addition, research relies heavily on the readily available valuation data provided by commercial VC databases, primarily VentureSource (formerly known as VentureOne) and Thomson One (formerly known as VentureXpert and Venture Economics). Furthermore, 35 articles focus on US samples, while just 13 focus on European samples. Only three studies were conducted on startup valuation in Asian countries, and seven articles adopted an international perspective. The review's findings regarding the articles' heavy reliance on commercial VC databases and the USA as the main geographical focus are in line with the survey of Da Rin, Hellmann, and Puri (2013) on the VC field in general.

Table 3: Selected articles on the determinants of startup valuation in the VC context

Study (Year)	Valuation / VC data source [a]	Country	Sample size	Sample period [b]	Analytical method [c]	Relevant dependent variable	Relevant research focus
Aggarwal et al. (2012)	Thomson One / Survey	US	432 ventures	Post-dotcom	Seemingly unrelated regression	Logarithm of pre-money valuation	Electronic word-of-mouth
Aggarwal and Hsu (2009)	Thomson One	US	91 biotech ventures	Pre-dotcom to post-dotcom	OLS regression	Logarithm of most recent VC valuation or market capitalization	Cooperative mode
Armstrong et al. (2006)	VentureSource	US	502 ventures	Pre-dotcom and dotcom	Rank regression	Pre-money valuation / Interpolated valuation	Financial, non-financial statement information
Baeyens et al. (2006)	Survey	Belgium	16 VCs	Post-dotcom [d]	Qualitative	n/a	Valuation methodologies
Batjargal and Liu (2004)	Survey	China	158 VC decisions	Dotcom	OLS regression	Difference in percentage of initially offered and finally assigned valuation	Strong ties (*guanxi*)
Bengtsson and Hsu (2015)	Thomson One	US	3,125 ventures	All	OLS regression	Logarithm of 1 + pre-money valuation	Ethnic ties
Bengtsson and Sensoy (2011)	Thomson One / VCExperts	US	1,266 ventures	Post-dotcom [e]	OLS regression	Logarithm of pre-money valuation	VC investor reputation

Table 3: Continued

Study (Year)	Valuation / VC data source	Country	Sample size	Sample period	Analytical method	Relevant dependent variable	Relevant research focus
Block et al. (2014)	Thomson One	US	2,341 ventures	Dotcom and post-dotcom	OLS regression	Logarithm of post-money valuation	Trademarks
Broughman and Fried (2012)	Hand-collected data	US	45 ventures	Dotcom and post-dotcom	OLS regression	Logarithm of ratio of last VC round valuation to sale price	Inside rounds
Chatterji (2009)	Thomson One / VentureSource	US	191 medical device ventures	n/a	OLS regression	Logarithm of pre-money valuation	Entrepreneurs with experience at prominent firms
Cochrane (2005)	VentureSource	US	7,765 ventures	Pre-dotcom and dotcom	Maximum likelihood estimate	n/a	Risk-return profile
Cumming and Dai (2011)	Thomson One	US	9,266 VC financing rounds	Pre-dotcom to post-dotcom	OLS regression	Logarithm of pre-money valuation	VC investor reputation, fund size, limited attention
Cumming and Dai (2013)	Thomson One	US	3,034 ventures	Pre-dotcom to post-dotcom	Heckman regression	Logarithm of pre-money valuation	Switching lead VCs
Cumming and Walz (2010)	Center of Private Equity Research (CEPRES)	International	5,038 ventures	Pre-dotcom to post-dotcom	OLS regression	Difference between logarithm of 1 + unrealized IRR and logarithm of 1 + predicted IRR	Reporting biases based on accounting and legal environment

Table 3: Continued

Study (Year)	Valuation / VC data source	Country	Sample size	Sample period	Analytical method	Relevant dependent variable	Relevant research focus
Davila and Foster (2005)	VentureSource / Survey	US [f]	78 ventures	Pre-dotcom to post-dotcom	Descriptive analysis and mean difference test	n/a	Management accounting systems
Davila et al. (2003)	Thomson One / VentureSource	US	494 ventures	Pre-dotcom and dotcom	OLS regression	Absolute magnitude of change in valuation over subsequent rounds	Headcount growth
Davila et al. (2015)	Survey	International	66 ventures	Pre-dotcom to post-dotcom [g]	OLS regression	Logarithm of pre-money valuation / Interpolated valuation	Management control systems
Dittmann et al. (2004)	Survey	Germany	53 VCs	Dotcom [d]	Descriptive analysis and OLS regression	Write-off rate of investments	Valuation methodologies
Falik et al. (2016)	Survey	Israel	144 entrepreneurs	New era	Ordered logit regression	Importance entrepreneurs attach to valuation measured on five-point Likert scale	Importance entrepreneurs attach to valuation
Fitza et al. (2009)	Thomson One	US	3,756 ventures	Pre-dotcom to post-dotcom	Variance decomposition analysis	Change in valuation over subsequent rounds per month	Value-add of VCs

Table 3: Continued

Study (Year)	Valuation / VC data source	Country	Sample size	Sample period	Analytical method	Relevant dependent variable	Relevant research focus
Gompers et al. (2010)	VentureSource	US	3,796 ventures	Pre-dotcom and dotcom	OLS regression	Logarithm of pre-money valuation	Successful serial entrepreneurs
Gompers and Lerner (2000b)	VentureSource	US	4,069 VC financing rounds	Pre-dotcom	OLS regression	Logarithm of pre-money valuation	VC fund inflows, public market valuations
Greenberg (2013)	Israeli Venture Capital (IVC) database	Israel	317 ventures	All	OLS regression	Logarithm of pre-money valuation	Patent applications and grants
Hand (2005)	Recap	US	204 biotech ventures	Pre-dotcom and dotcom	GMM regression	Logarithm of pre-money valuation	Financial, non-financial statement information
Hand (2007)	Recap	US	203 biotech ventures	Pre-dotcom and dotcom	GMM regression	Logarithm of 1 + round-to-round excess return	Risk-return profile
Heughebaert and Manigart (2012)	Hand-collected data	Belgium	180 ventures	All	OLS regression	Logarithm of pre-money valuation	VC firm type
Houlihan Valuation Advisors/ VentureOne (1998)	VentureSource	US	479 ventures	Pre-dotcom and dotcom	Descriptive analysis and OLS regression	Logarithm of pre-money valuation / Logarithm of change in valuation over subsequent rounds	Startup characteristics

Table 3: Continued

Study (Year)	Valuation / VC data source	Country	Sample size	Sample period	Analytical method	Relevant dependent variable	Relevant research focus
Hsu (2004)	Survey	US [h]	149 ventures	Pre-dotcom and dotcom [i]	OLS regression	Assigned pre-money valuation relative to highest offered valuation	VC investor reputation
Hsu (2007)	Survey	US [h]	149 ventures	Pre-dotcom and dotcom [i]	OLS regression	Logarithm of pre-money valuation	Startup founding experience, academic training, social capital
Hsu and Ziedonis (2013)	Thomson One / VentureSource	US	370 semiconductor ventures	Pre-dotcom to post-dotcom	OLS regression	Logarithm of pre-money valuation	Patent applications
Hwang et al. (2005)	VentureSource	US	9,092 ventures	Pre-dotcom to post-dotcom	Heckman selection correction using an ordered probit	n/a	Risk-return profile
Kaplan et al. (2007)	Hand-collected data	International	107 ventures	Pre-dotcom and dotcom	Descriptive analysis and OLS regression	Logarithm of pre-money valuation	Legal regime
Karsai et al. (1998)	Survey	Hungary, Poland, Slovakia	18 VCs	Dotcom [d]	Descriptive analysis and mean difference test	n/a	Valuation methodologies
Karsai et al. (1997)	Survey	Hungary	9 VCs	Dotcom [d]	Descriptive analysis	n/a	Valuation methodologies

Table 3: Continued

Study (Year)	Valuation / VC data source	Country	Sample size	Sample period	Analytical method	Relevant dependent variable	Relevant research focus
Korteweg and Sorensen (2010)	VentureSource	US [j]	1,934 ventures	Pre-dotcom to post-dotcom	Bayesian estimate	n/a	Risk-return profile
Lerner (1994)	Recap / Hand-collected data	US	173 biotech ventures	Pre-dotcom	OLS regression	Logarithm of pre-money valuation	Patent scope
Lockett et al. (2002)	Survey	Hong Kong, India, Singapore, US	154 VCs	Dotcom [d]	Mean difference test and OLS regression	Valuation methodology employed	Valuation methodologies
Manigart et al. (2000)	Survey	Belgium, France, Holland, UK, US	209 VCs	Pre-dotcom and dotcom [d]	Descriptive analysis and mean difference test	n/a	Valuation methodologies
Manigart et al. (1997)	Survey	Belgium, France, Holland, UK	136 VCs	Pre-dotcom and dotcom [d]	Descriptive analysis and mean difference test	n/a	Valuation methodologies
Masulis and Nahata (2009)	Thomson One / IPO prospectus	US	177 ventures	Pre-dotcom and dotcom	OLS regression	Ratio of CVC's average purchase price to IPO offer price	CVCs
Miloud et al. (2012)	Thomson One	France	102 ventures	Dotcom and post-dotcom	GLS regression	Logarithm of pre-money valuation	Industry organization, entrepreneurial resources, external ties

Table 3: Continued

Study (Year)	Valuation / VC data source	Country	Sample size	Sample period	Analytical method	Relevant dependent variable	Relevant research focus
Moghaddam et al. (2016)	Thomson One	US	151 software ventures	All	OLS regression	Logarithm of post-money valuation	Strategic alliances
Nicholson et al. (2005)	Recap	US	566 biotech ventures	Pre-dotcom and dotcom	OLS regression	Logarithm of post-money valuation or enterprise value	Strategic alliances
Pintado et al. (2007)	Survey	Spain	51 VCs	Dotcom [d]	Descriptive analysis and mean difference test	n/a	Valuation methodologies
Reber (2014)	Thomson One	US	1,360 ventures	Pre-dotcom to post-dotcom	Cascade neural networks	Risk-neutral success probability	Risk-return profile
Sander and Kõomägi (2007)	Survey	Estonia	5 VC firms	Post-dotcom [d]	Qualitative	n/a	Valuation methodologies
Seppä and Laamanen (2001)	Thomson One	US	176 ventures	Pre-dotcom and dotcom	OLS regression	Logarithm of risk-neutral success probability	Risk-return profile
Sievers et al. (2013)	Hand-collected data	Germany	127 ventures	Dotcom and post-dotcom	OLS regression	Logarithm of pre-money valuation	Financial, non-financial statement information
Smith and Cordina (2014)	Survey	UK, Belgium [k]	7 interviews	New era [d]	Qualitative	n/a	Financial statement information

Table 3: Continued

Study (Year)	Valuation / VC data source	Country	Sample size	Sample period	Analytical method	Relevant dependent variable	Relevant research focus
Sorensen (2007)	Thomson One	US	1,666 ventures	Pre-dotcom	Bayesian estimate of structural model	Latent valuation	VC investor experience
Valliere and Peterson (2007)	Survey	Canada, UK, US	59 entrepreneurs	Post-dotcom [d]	Conjoint analysis	Likelihood of accepting an offer measured on seven-point Likert scale	Valuation as selection criterion
Wasserman (2017)	Survey (CompStudy)	US	6,130 ventures	Dotcom to new era [l]	OLS regression	Logarithm of pre-money valuation	Founder control
Welpe et al. (2010)	Survey	Austria, Germany, Liechtenstein, Luxembourg, Switzerland	272 ventures	Post-dotcom [d]	Structural model	Change in valuation over subsequent rounds	VC investor experience and effort
Wright et al. (2004)	Survey	International	357 VCs	Pre-dotcom and dotcom [d]	Mean difference test and OLS regression	Valuation methodology employed	Valuation methodologies
Wright and Robbie (1996)	Survey	UK	66 VCs	Pre-dotcom [d]	Descriptive analysis and mean difference test	n/a	Valuation methodologies
Yang et al. (2009)	Thomson One	US	1,626 ventures	Pre-dotcom and dotcom	Panel linear regression [m]	Post-money valuation	Valuation capability of CVCs

Table 3: Continued

Study (Year)	Valuation / VC data source	Country	Sample size	Sample period	Analytical method	Relevant dependent variable	Relevant research focus
Zhang et al. (2016)	VentureSource	US	2,670 ventures	Pre-dotcom to post-dotcom	OLS regression	Pre-money valuation	Ethnic ties, social status
Zheng et al. (2010)	Recap	US	170 biotech ventures	Pre-dotcom and dotcom	GLS regression and minimum distance estimation	Logarithm of post-money valuation	Innovative capability, inter-firm network heterogeneity

[a] For the sake of comparability, the latest names of the respective databases are stated.

[b] The classification into the periods pre-dotcom (before 1996), dotcom (1996-2001), post-dotcom (2002-2008), and new era (2009-2016) is based on Figure 3.

[c] Employed analytical method to examine the scope of interest.

[d] Refers to the time when the survey was conducted.

[e] Bengtsson and Sensoy (2011) state that only 1% of their sample's financing rounds took place before 2004.

[f] A. Davila affirmed that the sample consisted of ventures in California, mainly Silicon Valley (personal communication, 9 December 2016).

[g] Davila et al. (2015) report that the ventures covered in the work's sample were founded between 1990 and 2008.

[h] D. H. Hsu acknowledged that Hsu (2004, 2007) rely on US data only (personal communication, 20 November 2016).

[i] Hsu (2004) reports the focal startups' years of incorporation, and also states that over 80% of the sample's startups undertook a Series A round between 1998 and 2000.

[j] A. Korteweg and M. Sorensen stated that the paper was based on US data only (personal communication, 17 November 2016).

[k] R. Cordina affirmed that the paper relied on interviews with investors based in the UK and Belgium (personal communication, 21 November 2016).

[l] N. Wasserman mentioned that the vast majority of the ventures in his sample raised VC funding extending from 1997 until right before the last year of the survey (personal communication, 16 November 2016).

[m] Y. Yang mentioned applying panel linear regression (personal communication, 17 November 2016).

Given the subject's diversity in terms of the determinants of startup valuation scrutinized, the fragmentation of the topic is obvious. Interestingly, startup valuation in the VC context is a research topic dominated by the field of management (see Table 4). This is evidenced in that the articles reviewed are dominated by the Journal of Business Venturing (n = 7) and the Strategic Management Journal (n = 5), followed by Venture Capital (n = 4), the Journal of Financial Economics (n = 3), and Entrepreneurship Theory and Practice (n = 3). At first glance, this finding might seem surprising; yet, given the aforementioned fact that startup valuation is particularly challenging, the realm of startup valuations in the VC context seems to be better explained by more concrete determinants, which are apparently more relevant to the research field of management.

Table 4: Top five identified journals

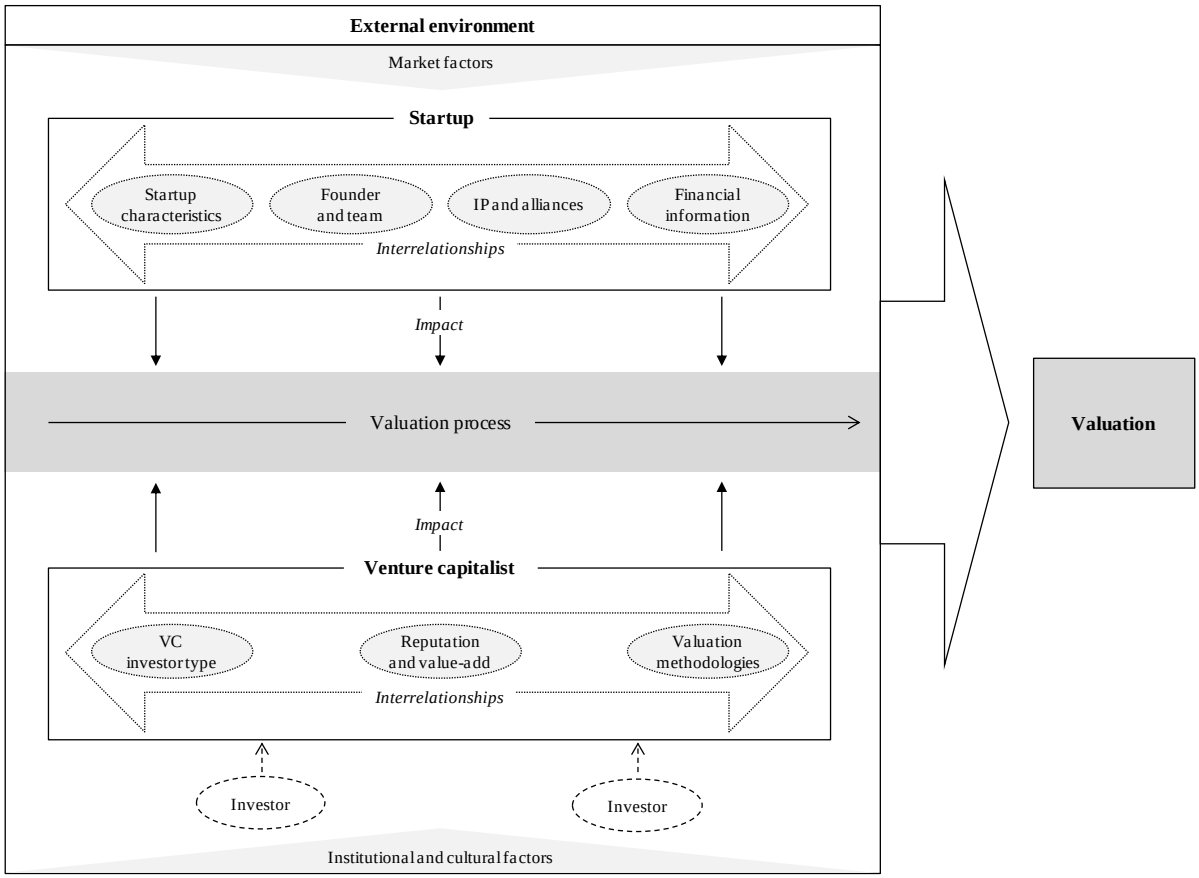
Rank	Journal	Articles	SJR 2015	JCR 2015
1	Journal of Business Venturing	7	4.923	4.204
2	Strategic Management Journal	5	6.278	3.380
3	Venture Capital	4	.939	-
4	Journal of Financial Economics	3	9.920	3.541
5	Entrepreneurship Theory and Practice	3	4.240	3.414

2.3 Toward an integrative framework

The preceding overview of the literature on the determinants of startup valuation in the VC environment illustrates the topic's complexity and heterogeneity (see Table 3), thereby highlighting the need for a conceptual framework that furthers the understanding of the determinants and their relationships regarding startup valuations in the VC context. To derive the conceptual framework a two-step approach was undertaken. First, all 58 papers were carefully read to identify the examined levels of the studied startup valuation determinants. In this vein, it became apparent that some articles focus on factors relating to startups (e.g., Block, De Vries, Schumann, & Sandner, 2014; Lerner, 1994; Moghaddam, Bosse, & Provance, 2016), and others focus on the valuation determinants directly related to VCs (e.g., Cumming & Dai, 2011; Heughebaert & Manigart, 2012). Moreover, there are also articles investigating external environment factors such as VC fund inflows (e.g., Gompers & Lerner, 2000b) or the institutional and cultural setting (e.g., Batjargal & Liu, 2004; Cumming & Walz, 2010). Con-

sequently, the integrative framework conceptualizes that startup valuations in the VC context are determined by a three-sided interplay of the determinants related to startups, VCs, and the external environment (see Figure 4).

Figure 4: Derived conceptual framework based on the review process



To classify the underlying determinants for each of the three levels, all papers were analyzed in a second step to extract each paper's relevant research focus in terms of the examined factors in the realm of startup valuations. Then based on an inductive and iterative process, for each level these factors were classified in superordinate valuation determinants, so that they provide an overarching and consistent classification (see Wood & McKelvie, 2015 for a similar approach). Following this procedure, the analysis revealed that the startup determinants can be divided into financial information and non-financial determinants, and that the latter can be further subdivided into startup characteristics (e.g., location, industry, or internal processes), founder and team characteristics, and intellectual property and alliances. The valuation determinants identified on the VCs' side encompass investor type, reputation and value-add, as well as the valuation methodologies relevant for VCs. The value-determining fac-

tors of the external environment can be classified into both market factors and institutional and cultural factors. Intriguingly, the respective determinants are to a certain extent interrelated. For instance, Hand (2005) finds evidence that as startups mature, financial information becomes more value-relevant than the non-financial form. On the VCs' side, for example, Wright et al. (2004) show that VCs' use of particular valuation methodologies depends on the institutional setting.

2.3.1 Determinants related to startups

Startup characteristics. On the startup-level, Houlihan Valuation Advisors/VentureOne (1998) find that industry and location are decisive determinants of startup valuations; in the context of the report that means that more profitable ventures and startups operating in the communications industry and firms located on the east and west coasts of the USA receive higher valuations. Regarding industry relevance, Sievers et al. (2013) apply an OLS regression method to show that German life science and traditional high-tech ventures are valued at a discount, while internet startups are valued at a premium, but that these coefficients are not statistically significant. In the same vein, Miloud et al. (2012) building on established theories in strategic management scrutinize an industry's impact on startup valuations by specifically accounting for its growth rate in terms of the industry's revenue growth and its degree of product differentiation measured by research and development (R&D) and advertising intensity. Consequently, Miloud et al. (2012) illustrate that in the case of 102 French startups from 18 different industries, VCs assign higher valuations to ventures operating in highly differentiated industries and industries with higher growth rates.

Davila, Foster, and Jia (2015) find that for a cross-sectional sample of 66 startups around the world, VCs assign a premium to startups adopting management control systems, believing that they improve decision-making and execution. Moreover, the effect is apparently more significant for startups operating in high growth and competitive markets and also for the use of strategy-implementing systems. Similarly, Davila and Foster (2005) find a positive association between the early adoption of management accounting systems, which they define as a subset of management control systems, and valuations.

Furthermore, Houlihan Valuation Advisors/VentureOne (1998) show that, on average, valuations rise from round-to-round. Likewise, Davila, Foster, and Gupta (2003) also report that headcount growth positively correlates with changes in valuation over successive financing rounds. Interestingly, as financing round generally covaries with firm age, Sievers et al. (2013) find that in Germany firm age is insignificant in explaining startup valuations, implying that conducting a new financing round is more informative than a startup's age. However, the finding stands in contrast to that of Armstrong, Davila, and Foster (2006) who, while also controlling for funding series, find that age is significant and negatively related to valuation among US startups. Armstrong et al. (2006) speculate that this might be rooted in VCs' time-to-exit rationale, as a longer time-to-exit is associated with lower returns.

Overall, it is clear that the general characteristics of startups are decisive factors that determine their valuation in the VC context.

Founder and team characteristics. In general, VCs consciously look for founder and team characteristics that offer clues as to the quality of a startup, knowledge of which can inform the valuation (MacMillan, Siegel, & Narasimha, 1985). Factors that can increase startup valuations include having more than one founder, a complete management team, prior startup, management and relevant industry experience, and also the level of education (Hsu, 2007; Miloud et al., 2012; Sievers et al., 2013; Wasserman, 2017).

Chatterji (2009) illustrates that within the medical device industry entrepreneurs with prior experience at incumbent enterprises are assigned higher valuations than other entrants in the last private financing round. In addition, Hsu (2007) shows that entrepreneurs with previous experience of founding a startup who achieved high financial returns with their prior ventures (i.e., an internal rate of return of at least 100% on Series A investments at an exit event) attract higher valuations for their new ventures. Wasserman (2017) also establishes the connection between prior founding experience and higher valuations. Conversely, Gompers, Kovner, Lerner, and Scharfstein (2010) report that successful serial entrepreneurs do not receive higher valuations for their new ventures. Notwithstanding this, Falik, Lahti, and Keinonen (2016) find that inexperienced Israeli entrepreneurs attach greater importance to valuation, arguing that their possible inferior bargaining position might cause them to be more concerned with valuation. In contrast, Valliere and Peterson (2007) report that, regardless of their experience, entrepreneurs from the USA, Canada, and the UK consider valuation as the

primary criterion for an investment deal. These results are interesting as they imply that cultural differences could explain the different findings regarding the importance entrepreneurs attach to valuation.

The findings of Wasserman (2017) on the subject are particularly interesting as they show that founders might have to surrender control to acquire a higher valuation. That said, Wasserman (2017) also finds that ventures in which the founder is still CEO and/or controlling the board of directors at the time of the most current financing round are assigned lower valuations. Furthermore, Hsu (2007) and Wasserman (2017) report that the personal networks of entrepreneurs are associated with higher valuations as such networks facilitate entrepreneurs recruiting employees. Hsu (2007) argues that this therefore suggests less effort would be required of VCs, and signals the potential for strong performance.

In sum, founder and team characteristics are decisive determinants of VCs' investment decisions, and in turn of startup valuations owing to their perceived risk-reducing attributes and the improved performance expectation they entail (e.g., Hsu, 2007).

Intellectual property and alliances. Intellectual property is significant to VCs as it can, among other things, further the reduction of asymmetric information (Block et al., 2014; Greenberg, 2013). Lerner (1994) shows that the number and breadth of patents for biotech startups within the US context are positively related to those startups' pre-money valuations. In later studies, Hand (2005) also relating to biotech startups, Armstrong et al. (2006) across industries, and Hsu and Ziedonis (2013) for 370 semiconductor startups, are consistent in finding that the number of patent applications filed is associated with higher startup valuations. Hsu and Ziedonis (2013) show that patent applications are more relevant in early financing rounds and that this effect is even more pronounced when founders lack prior experience in taking a startup public. Notwithstanding this, Hand (2005) reports that on a round-by-round basis patents' value relevance is remarkably low, and in contrast to Lerner (1994), the same study identifies a significant negative relationship between patent scope and startup valuations, which the author surmises might result from value relevance changing from portfolios of broadly-scoped patents to narrowly-scoped ones over time.

Intriguingly, Greenberg (2013) conducts a fine-grained analysis of 317 Israeli technology startups differentiating between pending and granted patents and finds that patent applica-

tions are significant and positively related to venture valuations, but with the significance reducing from the life sciences, to communications through to the semiconductor industry, while they are not relevant to the valuations of software startups. Furthermore, records of patents granted show an additional value-enhancing effect on non-software pre-revenue startups in their early stages, but the patents measure becomes less significant as ventures mature, indicating their uncertainty mitigating effect.

Additionally, Block et al. (2014) scrutinize the relevance of both trademarks and patents to startup valuations on the grounds that trademarks also enable startups to protect their intellectual property and to signal their market and growth orientation. The authors report an inverted U-shaped relationship between both the number and breadth of trademark applications and startups' post-money valuations, implying that the additional costs in terms of, for instance, coordination efforts outweigh the advantages of a more diversified trademark and indicated product portfolio, thus leading to lower startup valuations. Moreover, the authors report a declining valuation impact of trademark applications as startups mature and enter their more sophisticated development stages.

For startups, strategic alliances offer powerful means to gain access to resources and to signal investee quality, thereby reducing information asymmetries (Miloud et al., 2012; Nicholson, Danzon, & McCullough, 2005; Uzzi, 1996). Based on signaling theory, Nicholson et al. (2005) show that biotech ventures with strategic alliances with pharmaceutical companies receive higher valuations. Miloud et al. (2012) and Sievers et al. (2013) come to the same conclusion for French and German startups in terms of network size and having a cooperation partnership. In addition, the results of Hand (2005) are consistent in that the number of strategic alliances are, on average, positively associated with the valuations of biotech startups, even though the valuation effect on a round-by-round basis is noticeably low. Expanding on this, Moghaddam et al. (2016) show that for VC-backed software startups in the USA, alliances have a positive impact on valuations, but that too many alliances can deplete valuation, which the authors ascribe to the fact that startups might lack the resources and capability to handle large numbers of alliances.

Furthermore, Aggarwal and Hsu (2009) illustrate that selecting a cooperative mode that makes less use of a venture's previous governance capability is generally accompanied with a valuation discount for biotech ventures, suggesting that investors regard this as a risky

undertaking. The accompanying caveat is that this valuation impact is mitigated in hot and, in turn, less risk averse markets. Zheng et al. (2010) show that the valuation effect in terms of a startup's network status (external resource) decreases, while that of its innovative capability (internal resources) increases as the startup matures. Moreover, the authors document an increasing complementary valuation effect of innovative capability and network heterogeneity.

Overall, VCs seem to view intellectual property and alliances as means to reduce information asymmetries and as value-enhancing factors emphasizing their importance for startup valuations in the VC context (Block et al., 2014).

Financial information. In addition to non-financial information, entrepreneurs also provide VCs with exhaustive financial information, so balance sheet and income statement figures should provide investors with sufficient means to appraise a startup's future financial performance (Manigart, Wright, Robbie, Desbrières, & De Waele, 1997). In this regard, it is crucial to understand if, and if so to what extent, current accounting information can explain startup valuations in the VC market. Hand (2005) pioneered this strand of research examining the value relevance of financial statement information for a sample of successful private VC-backed biotech startups in the USA. He finds that accounting information is generally value-relevant in the VC context and that cash, non-cash assets, and R&D expenses are positively associated with pre-money valuations, while stock option dilution and long-term debt have a negative relationship to a valuation. Moreover, he shows that the value relevance of financial statement figures increases as startups mature, while the opposite is true for non-financial information, indicating substitutional dynamics between financial and non-financial accounting information. Interestingly enough, Smith and Cordina (2014) provide qualitative support for Hand's (2005) finding that financial statement information tend to become more important as startups mature in a study focusing on the UK and Belgium in a later period. Analogously, Wright and Robbie (1996) find that later-stage VC investors in the UK put significantly more weight on financial information, while Wright et al. (2004) did not find such an effect across a range of institutional environments.

Armstrong et al. (2006) extend the research of Hand (2005) in applying rank regression across industries of successful startups that went public in the USA. The last study aligns with Hand (2005) in concluding that higher revenues lead to higher startup valuations and that the same holds true for cost components (cost of sales, sales, marketing, general, and adminis-

trative expenses, R&D expenses). The results confirm that investors view cost components as value-enhancing investments to generate future cash flows (Armstrong et al., 2006).

Sievers et al. (2013) using a hand-collected data set for German VC-backed firms report that financial statement information is also value-relevant for startups in Germany. Specifically, the study states that cash, revenues, and R&D expenses have a positive impact on startup valuations, while selling, general, and administrative expenses have a negative effect, a finding countering that of Armstrong et al. (2006). In the context of the study of Sievers et al. (2013) this latter group of expenses are by VCs thus rather regarded as operational disbursements. In addition, the authors detect that financial and non-financial statement information is equally meaningful in explaining 51% of the variance in pre-money valuations, whereas a combination of both increases the explanatory power to 62%, implying that both components seem to be, on average, complements. Davila and Foster (2005) report a positive and significant correlation between change in valuation and change in both revenues and the number of employees in non-biotech ventures, whereas change in income is not significant, highlighting that in the early stages valuation is related to growth. For biotech ventures the authors identify a positive correlation between change in valuation and growth in employees and a negative one for change in income.

Overall, financial statement information is important for startup valuations in the VC context.

2.3.2 Determinants related to VCs

VC investor type. The most easily observable determinant on the VCs' side is the VC investor type. Heughebaert and Manigart (2012) suppose that VC investors are heterogeneous and hence that VC firm type goes along with bargaining power, implying that VCs with relatively stronger bargaining power set lower startup valuations. In linking a VC type's deal sourcing and investment strategy with bargaining power, Heughebaert and Manigart (2012) find that for 180 Belgian VC-backed startups a proprietary deal flow (as in the case of university VC firms) and lower investor competition (as represented by government VCs targeting niche markets) lead to lower startup valuations than those set by IVCs in line with the bargaining power argumentation mentioned above. Interestingly, the same study finds that CVC firms' valuations accord with those of IVCs. In a similar manner, Sievers et al. (2013) find

that corporate lead investors do not significantly influence the valuations of German startups, whereas, for instance, Hand (2005) reports the group having a significantly positive effect for a sample of US biotech startups.

Moreover, Masulis and Nahata (2009) find competitive CVCs, which invest in competing startups, assign higher valuations than their complementary counterparts, which invest in startups with complementary relationships. They argue that this is in line with standard bargaining theory, and is connected to the potential for moral hazard issues that startups might face when they have a competitive corporate investor. In addition, Yang, Narayanan, and Zahra (2009) try to explain the startup valuations set by CVCs by applying organizational learning theory. The authors consider CVCs' valuation capabilities, that is not to overvalue startups, as a learning process that enhances with experience. The authors' sample of 166 US public firms with CVC investments in 1,626 ventures supports the notion that CVCs' valuation capability improves with stage diversity, which is the degree of experience of investing in startups from different development stages.

VC investor type is a critical determinant for startup valuations, illustrating that in this context the heterogeneity of VCs plays an important valuation role.

Reputation and value-add. Hsu (2004) uses a hand-collected sample of 246 professional first-round offers to 149 US startups to show that the entrepreneurs of startups in receipt of several offers tend to prefer the lower valuation offers of highly reputable VCs, indicating that entrepreneurs accept a valuation discount in expectation of better value-adding services delivered by VCs with a strong reputation. Bengtsson and Sensoy (2011), among others, confirm this finding. Indeed, Welpe, Dowling, and Picot (2010) demonstrate that over successive rounds more experienced VCs also add more value, while they do not find a positive effect commensurate with VCs' effort.

Beyond that, Fitza, Matusik, and Mosakowski (2009) establish that the capacity of VCs to add value varies considerably, and that some VCs can even have a negative value effect. Intriguingly, this puts into perspective the findings of Falik et al. (2016) that Israeli entrepreneurs in general attach more importance to the valuation when dealing with less reputable VCs. Furthermore, as outlined by Sorensen (2007) there is a positive sorting in the market in that more experienced VCs also invest in startups of higher quality. Gompers et al. (2010)

also find evidence that more experienced VC firms assign higher startup valuations. To put their findings into perspective, Gompers et al. (2010) argue that the reason for this finding lays in the fact that their study adopts an *across venture* approach that does not segregate the effect of VC investor quality on startup valuations, whereas Hsu (2004) scrutinizes *within-venture* offers and thus controls for different levels of startup quality. Similarly, Cumming and Dai (2013) study the dynamics of positive sorting in view of asymmetric information and agency cost, and report that startups with better future performance potential are more inclined to switch to VCs with higher reputation, and startups that switch lead VCs generally achieve higher valuations. Moreover, Cumming and Dai (2013) document that entrepreneurs who switch to higher-reputation VCs accept lower valuations.

Alongside VC reputation, Cumming and Dai (2011) examine the effects of fund size and VCs' limited attention on the valuations of startups by studying 9,266 financing rounds in the USA. The authors' findings assert that more reputable VCs assign lower valuations, and additionally that fund size is usually negatively related to startup valuations, implying that larger fund size is associated with more bargaining power. In view of this, it should be remarked that fund size can also serve as a measure of VCs' quality, and thus their reputation (Bengtsson & Sensoy, 2011; Kaplan & Schoar, 2005).[10] However, Cumming and Dai (2011) show that when fund size becomes disproportionately large, meaning that human capital does not grow proportionally to fund size, VCs' outside options are reduced and thus, their relative bargaining power is negatively affected, indicating that VCs' limited attention leads to higher startup valuations.

In summary, VCs' reputation and their value-add capabilities are important factors that shape startup valuations.

Valuation methodologies. Valuation methodologies can be a decisive ingredient in the valuation process, which is because the valuations derived typically provide an important indication of the range within which a final valuation will be negotiated (DeAngelo, 1990; Wright & Robbie, 1996). Indeed, as Baeyens, Vanacker, and Manigart (2006) point out conflicting views on valuation are the most crucial factor in failed negotiations. The study of Baeyens et al. (2006) reveals this might be even more so in the realm of biotech ventures,

[10] The author is grateful to an anonymous reviewer for pointing this out.

where VCs do not consider the standard valuation methodologies sufficiently reliable, and in turn prefer qualitative measures. It is thus not surprising that VCs usually apply multiple valuation methodologies and then often prioritize one particular method (Wright & Robbie, 1996). Intriguingly, Dittmann, Maug, and Kemper (2004) reporting on a sample of 53 German VCs empirically establish that VCs relying on a range of valuation methodologies show a significantly reduced rate of failed investments. In addition, the study finds that the use of flow variable valuation multiples, like revenue or free cash flow multiples, do not significantly relate to investment performance. Accordingly, Sievers et al. (2013) show that industry-specific total asset multiples have a higher valuation accuracy than their revenue counterparts in the case of German startups.

Moreover, Manigart et al. (1997) emphasize that the risk-return trade-off plays a crucial role in the realm of startup valuations. In this vein, Manigart et al. (1997) and Pintado, De Lema, and Van Auken (2007) among others, show that in line with finance theory, greater perceived risk prompts VCs to demand higher required returns, which should ceteris paribus lead to a lower valuation. This finding is also in line with those of Houlihan Valuation Advisors/VentureOne (1998) who show that earlier financing rounds are generally associated with lower valuations. In fact, Seppä and Laamanen (2001), working with a sample of US VC investments using a binomial model, provide empirical evidence that startups' risk-neutral success probabilities are lower in their early stages. This might also be traced back to a startup's bankruptcy risk arising from the uncertainty involved, which is likely to be highest in its early stages and which should decrease as the startup reaches the more advanced stages of development (e.g., Engel, 2004; Ruhnka & Young, 1991).[11]

Generally, to derive the proper risk-adjusted rate of return—typically based on the CAPM (Capital Asset Pricing Model)—finance theory states that investors should only be compensated for systematic risk, because a project's unsystematic risk can be diversified away (Brealey, Myers, & Allen, 2011). Cochrane (2005), correcting for sample selection, finds that the systematic risk for startup investments declines on a round-by-round basis (average beta of .6), while Korteweg and Sorensen (2010) find an average beta of 2.8. Hwang, Quigley, and Woodward (2005) point out that Cochrane (2005) relies on a subset of their data and also estimate a beta of less than 1.0. One explanation for these differing results might be

[11] In this regard, it should be noted that the risk-neutral probability also forms the basis of the seminal work of Merton (1974) on estimating bankruptcy risk.

that the studies use the data provided by Sand Hill Econometrics (now incorporated into VentureSource), but that Korteweg and Sorensen (2010) use a newer dataset that was corrected for prior data problems (Da Rin et al., 2013). Ang and Sorensen (2012) conclude that the higher average beta seems the more understandable in the startup context.[12]

Interestingly, when comparing the predictive power of risk-neutral and risk-adjusted approaches, Seppä and Laamanen (2001) find that the former better explains future valuations in terms of a binomial model. Reber (2014) extends this research combining the binomial model with cascade neural networks and shows that this approach has greater predictive power than risk-adjusted valuation approaches, regular neural networks, and linear regression models, but that the estimation errors remain relatively high. Moreover, Hand (2007) documents that for US biotech ventures, VCs' returns between financing rounds are negatively related to firm size and positively related to book-to-market ratios. It is particularly interesting that Dittmann et al. (2004) demonstrate that VCs who rely on the DCF (Discounted Cash Flow) method in combination with an objectifiable discount rate in line with the CAPM or the WACC (Weighted Average Cost of Capital) approaches have a better investment performance than their peers.

In addition to the above, Lockett, Wright, Sapienza, and Pruthi (2002), Manigart et al. (2000), and Wright et al. (2004) find that the use of specific valuation methods varies across institutional environments. Wright et al. (2004) document that among VCs the DCF method is more prominent in Germanic legal systems than in English-style common law based systems, while the opposite holds for valuation multiples. In view of this, Dittmann et al. (2004) for Germany, Karsai, Wright, and Filatotchev (1997) for Hungary, Karsai, Wright, Dudzinski, and Morovic (1998) in addition for Poland and Slovakia, Manigart et al. (2000) for Belgium and the Netherlands, Pintado et al. (2007) for Spain and Sander and Kõomägi (2007) for Estonia show that the DCF method is very popular in these countries. One explanation for these results could be that these markets lacked proper benchmark valuations at the time they were studied. Such a lack might prompt VCs to use the forward-looking DCF valuation method (Karsai et al., 1998). Equally interesting is that Manigart et al. (1997) show that VCs' levels of required returns vary across countries. For instance, VCs from the UK require higher returns than their counterparts from France, while Belgian and Dutch VCs demand the lowest

[12] It should be noted that the work of Ang and Sorensen (2012) was not part of the selected papers.

required returns of the sample. According to Manigart et al. (1997) this implies that theoretically VCs from the UK should be assigning lower valuations to startups than their counterparts from France, Belgium and Holland.

In essence, the above findings highlight that valuation methodologies are a factor that should not be underestimated in the VC context.

2.3.3 Determinants related to the external environment

Market factors. Gompers and Lerner (2000b) were the first authors to find evidence that fund inflows into the VC industry increase startup valuations and that this effect could, from a financial perspective, neither be traced back to a startup's better risk profile nor to improved cash flow expectations. The authors suggest that increased supply in the VC industry implies higher competition among VCs, thus leading to higher startup valuations. In addition, Gompers and Lerner (2000b) show that public market valuations also increase startup valuations. Similarly, Lerner (1994) and Hand (2005, 2007) find that the valuations of private biotech ventures are positively driven by the equity valuations of public biotech firms, indicating that the valuations of publicly listed firms are viewed as an indication of a startup's economic potential.

Moreover, particularly in the USA, blogs on startups and VCs have become an important source of information. Positive blog coverage can serve both as cheap marketing for startups and send a positive signal to VCs (Aggarwal, Gopal, Gupta, & Singh, 2012). Aggarwal et al. (2012) empirically establish that ventures benefiting from positive electronic word-of-mouth from popular blogs receive higher valuations. The authors also conduct a supplementary survey with VCs and entrepreneurs to discern whether the media coverage from popular blogs directly, indirectly, or both indirectly and directly impacts startup valuations. Intriguingly, they find an indirect relation, meaning that media coverage from popular blogs attracts more VCs and the consequent increase in competition among the VCs increases entrepreneurs' negotiation power and, in turn, the valuations of their startups.

Institutional and cultural factors. VCs are likely to have the greatest bargaining power if startups are unable to attract new investors, meaning they could negotiate relatively low valuations. Follow-on investments also illustrate that startup valuations in the VC industry are

dynamic, in that they change over time. Interestingly, the findings of Broughman and Fried (2012) who use a hand-collected sample of 45 US startups backed by VCs run counter to the bargaining power argumentation, in that they reveal that inside rounds (i.e., investment rounds that do not involve new VCs) primarily occur with struggling startups, and take place at relatively high valuations. The authors suppose that these relatively high valuations may be connected to litigation risk, meaning that VCs seek to avoid being accused of exploiting entrepreneurs in inside rounds instead of capitalizing on their bargaining position.

Interestingly, Kaplan, Martel, and Strömberg (2007) studying 145 VC investments in 107 ventures in 23 countries find in their descriptive analysis that pre-money valuations vary across legal regimes. Furthermore, the same work reports that VCs do not trade off more downside protection in the form of US style contractual terms against a higher startup valuation, but that the opposite holds. Similarly, Cumming and Walz (2010) study VC funds from 39 countries and find that VCs tend to assign higher valuations to their unrealized investments in countries with less regulated legal and accounting systems. The authors suggest that the reason might lie in the fact that IVCs depend on their investors in terms of raising new funds and might thus be tempted to overstate the reported valuations of their portfolio companies.

Wright et al. (2004) report that the cultural context plays an important role in the relative weight of a particular information source. The authors argue and show that Asian VCs, for example—in view of the fact that VCs are not members of entrepreneurs' networks before establishing a relationship—place significantly less importance on the information provided by the entrepreneurs than their counterparts from the USA. In the Asian context, Batjargal and Liu (2004) reviewing 158 investment decisions from VCs based in China ascertain that Chinese VCs with strong ties from previous relationships with entrepreneurs tend to assign higher valuations to the startups of those entrepreneurs. The authors hypothesize that in line with the concept of *guanxi*, strong social ties are important trust-building and, in turn, risk-reducing measures that affect the startup valuations of Chinese VCs.

Similarly, Bengtsson and Hsu (2015) show that ethnic matches between Chinese, Indian, Japanese, Jewish, Korean, Russian, Hispanic and Vietnamese entrepreneurs and VCs in the USA lead to higher startup valuations. The authors reason that this is in line with the notion of enforced trust and kinship. By the same token, also in the context of the USA, Zhang, Wong, and Ho (2016) analyze first-round VC investments and find that Asian VCs (i.e., VCs

with a majority of Asian general partners and Asian limited partners) assign higher valuations to non-Asian-led Silicon Valley-based ventures than do non-Asian VCs. The authors argue that Asian VCs suffer from lower social status when dealing with non-Asian startups and are thus forced to assign higher valuations. To corroborate their findings of the lower status argumentation, Zhang et al. (2016) test for the reverse effect and show that non-Asian VCs do not assign higher valuations to Asian-led Silicon Valley-based ventures.

In sum, startup valuations in the VC industry are also shaped by the external environment, emphasizing that valuations are not only contingent on factors related to the startup and VC investor level.

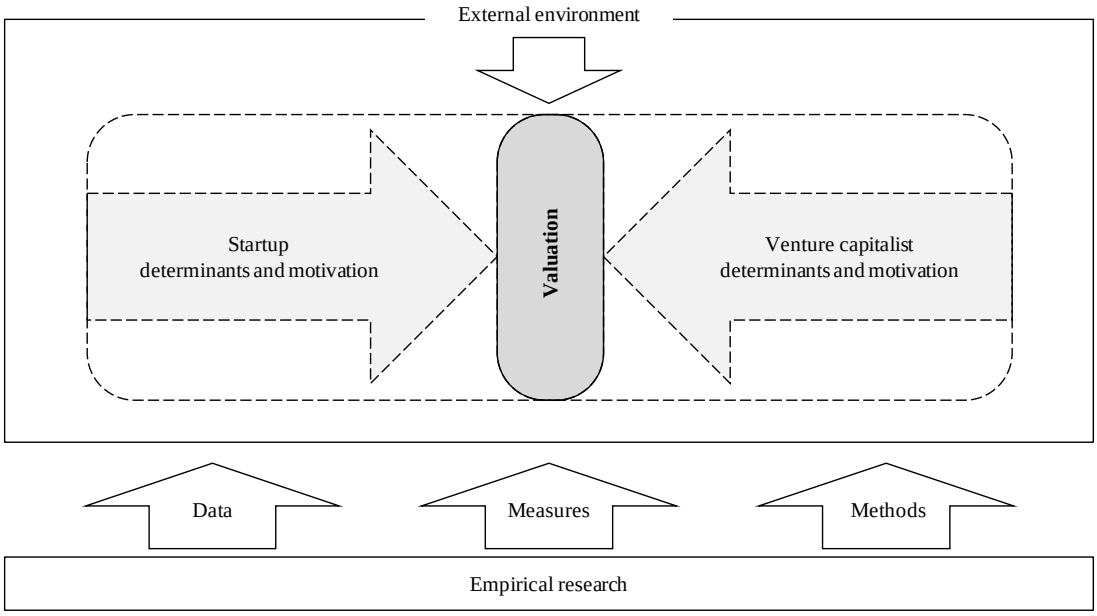
2.4 Discussion

This paper conducted a systematic review of the current literature on the determinants of startup valuations in the VC context. It compiled empirically relevant research and developed an integrative framework to organize the extant literature. Additionally, the systematic review revealed weaknesses and academic voids that pave the way for future research. These findings emphasize the need for future research to shed further light on startup valuations by simultaneously taking the determinants and motivations of startups or their entrepreneurs and VCs into account (see Figure 5).

First, a significant shortcoming of the existing empirical research on the determinants of startup valuation in the VC industry stems from the excessive reliance on commercial VC databases, which only state the final valuations, meaning the valuation process itself remains a black box. Indeed, while some of the identified papers talk about the valuation or negotiation process (e.g., Heughebaert & Manigart, 2012; Moghaddam et al., 2016; Yang et al., 2009), the author has found no empirical study directly examining the valuation process itself. However, as outlined in the derived framework, startup valuation in the VC context is a dynamic process such that valuations change during the negotiations until both VCs and entrepreneurs decide upon a final valuation (Yang et al., 2009). In this vein, entrepreneurs often also receive multiple offers at a specific point in time with (usually) varying valuations (Hsu, 2004). Thus, the use of VC databases means that scholars cannot observe and examine the valuation formation process or the dynamic factors and mechanisms shaping it in detail. In that sense, future research must scrutinize the valuation or negotiation process not only from a

theoretical perspective (e.g., Kirilenko, 2001; Narayanan & Lévesque, 2014) but above all from an empirical one. Hsu (2004) is an excellent example of how to overcome this shortcoming and highlights that future research needs to address the dynamics and heterogeneity of startup valuations in greater detail. To do so, researchers could, for instance, capitalize on televised business pitches such as those illustrated in the *Dragons Den* series (e.g., Narayanan & Lévesque, 2014; Pollack, Rutherford, & Nagy, 2012) where they can directly observe the valuation process and the underlying determinants.

Figure 5: Avenues for future research on the determinants of startup valuation in the VC context



Second, scholars need to put their findings into a clearly understandable context to ensure those findings are a representation of the real world and not merely of methodological relevance (e.g., Ketchen & Shook, 1996). Thus, to substantiate and validate the cogency of the findings, future work might capitalize on the approach of Aggarwal et al. (2012) by additionally employing expert feedback. In addition, researchers also need to put their findings into the context of previous work, as for instance Gompers et al. (2010) did when setting their findings against those of Hsu (2004). This is particularly important in light of the respective sample period. Researchers must be wary when generalizing and transferring the effects of the determinants of startup valuations in the VC context from one period to another. That said, the identified determinants and their respective impacts might change over time,

and hitherto unknown factors might also become relevant. Consequently, future work should study the determinants of startup valuations by comparing their relevance for the different periods. Similarly, conflicting results might also be explained in view of the underlying datasets. Interestingly, Cochrane (2005) and Korteweg and Sorensen (2010) both rely on the data provided by Sand Hill Econometrics yet report different results. One explanation might be that the latter had a more current version that was corrected for data problems. This effect might be even more pronounced when the findings based on commercial databases are compared to research relying on survey data. Specifically, commercial datasets are naturally limited in terms of the available data, implying that conflicting results might be explained by omitted variable bias.[13] Consequently, regarding the underlying dataset, researchers should address conflicting results in a more comprehensive manner. Moreover, there is a need for consistent measures. Specifically, the reputation of VCs can be measured in several ways such as experience in terms of age, capital under management, IPO frequency, IPO capitalization share (Krishnan, Ivanov, Masulis, & Singh, 2011), or fund size (Bengtsson & Sensoy, 2011; Kaplan & Schoar, 2005). Accordingly, more research is required on the most suitable measures for the different determinants of startup valuations if the research on the factors determining startup valuations in the VC context is to become more robust and comparable.

Third, researchers prefer the US context for examining the determinants of startup valuations in the VC setting. Nonetheless, this article shows that startup valuations in the VC context are also influenced by the external environment, suggesting that "VC valuation and negotiation processes may hence be different in different parts of the world" (Heughebaert & Manigart, 2012, p. 527). Therefore, researchers should not only expand the geographical scope of their analysis but also explicitly consider the characteristics of the institutional and cultural environments the startups are nested in to examine the variability of startup valuations across countries (Wright, Pruthi, & Lockett, 2005; Wright & Robbie, 1998). Furthermore, the scrutinized work in this domain is dominated by regression analysis providing sufficient leeway for future research to use emerging methods such as qualitative comparative analysis (QCA) (Berger & Kuckertz, 2016).

[13] The author is grateful to an anonymous reviewer for highlighting this point.

Fourth, Cumming and Dai (2011), Heughebaert and Manigart (2012) and Hsu (2004), among others, state that VCs' characteristics such as reputation, fund size, and investor type influence startup valuations. Interestingly, the findings on the impact of CVCs' involvement on startup valuations is mixed. One possible explanation for these mixed results is that these studies regarded CVCs as a homogeneous group; however, CVCs might also differ in their investment motivation to the extent it is determined by their strategic and financial orientation. Although, Masulis and Nahata (2009) differentiate types of investments, they do not focus on the overall investment motivation of CVCs. Thus, future research needs to examine the heterogeneity of CVCs, for instance by capitalizing on the study of Röhm et al. (2018), to better understand the valuations they assign. In a similar manner, current research has overlooked to study the impact of team heterogeneity on startup valuations, for example, in terms of professional background, education, age or perspective in the sense of prior startup success and failure experience. Along these lines, current research often pools a startup team into dummy variables, such as to measure if any founder or team member had pervious startup, founding, industry or IPO experience (e.g., Hsu & Ziedonis, 2013; Miloud et al., 2012; Sievers et al., 2013), therewith disregarding the various levels of team heterogeneity. Consequently, by drawing on the work of Zimmerman (2008), who studies the influence of team heterogeneity on the amount of capital raised through an IPO, a promising path for future research is to apply heterogeneity measures to examine the impact of the different dimensions of team heterogeneity on startup valuations.

Fifth, as outlined by Cumming and MacIntosh (2000) in contrast to public firms, where stock prices represent the heterogeneous opinions of the market participants, startup valuation is significantly riskier because VCs must usually rely on their own valuation capabilities. Therefore, it is not only important to understand which valuation methodologies are applied by VCs, but also in what way they are applied. Hence, future research should address how the use of specific valuation methodologies and the assessment of their underlying assumptions affect startup valuations. Similarly, future researchers might also be able to unravel the determinants leading to over- and undervaluation when comparing the outcome of the valuation methodologies with the actual valuations assigned. Indeed, Khanna and Mathews (2016) outline theoretically that VCs might rationally assign higher valuations in later funding rounds than necessary, possibly to posture a startup against its competitors and thereby spur its entrepreneurs to increase their efforts. Thus, empirically examining these valuation ration-

ales is of utmost importance to further the understanding of startup valuations in the VC context.

2.5 Limitations

This paper has shed light on the determinants affecting startup valuations in the VC context, but it has some limitations that must be addressed. First, the paper relies on only two databases, applies a journal quality threshold, and focuses on English-language journal articles meaning that, for instance, working papers were excluded. However, the last two means were necessary to guarantee the identification of high quality impactful research. Moreover, by conducting an additional search—that wherever possible included a full-text query—the taken approach should provide a solid basis to create a holistic view of the state of the empirical literature. Second, the paper might apply too narrow inclusion and exclusion criteria, and the selection of the papers might be subjectively biased. However, in light of the paper's underlying setting the narrowed focus was a necessity, as for instance it permitted the exclusion of articles focusing on young public firms that are irrelevant in the scrutinized VC context. Third, from a financial perspective, business plans including a startup's projected cash flows usually provide the basis for a startup's financial valuation in the VC context (e.g., Douglas, Carlsson-Wall, & Hjelström, 2014; MacMillan et al., 1985; Manigart et al., 1997) and it is therefore surprising that none of the selected articles directly examined the reliability and impact of the business plans provided by entrepreneurs on startup valuations. Admittedly, this review cannot claim to provide a complete picture of the matter, and relevant factors might not have been identified in the course of the review. Nevertheless, the author is confident that this review and the derived framework provide a good starting point from which to deepen the understanding of the determinants influencing startup valuations in the VC environment, and that the article can pave the way for future research.

2.6 Conclusion

This paper has compiled relevant empirical research on the determinants of startup valuations in the VC context. It illustrates that in the VC market, startup valuations are determined within a complex setting because the interplay and dynamics of the different factors concerning startups, VCs, and the external environment all contribute to the final outcome. Beyond that, as revealed by the underlying review of the literature, it became obvious that

current research thus far only scratched the surface of uncovering the determinants of startup valuations. Therefore, this research area will greatly benefit by addressing the identified research gaps. In this regard, the illuminated paths for future research together with more comprehensive datasets and measures, in combination with emerging research methods, will further disentangle the determinants influencing startup valuations in the VC context.

3 Exploring the differences in early-stage startup valuation across countries: An institutional perspective[14]

Abstract

Countries increasingly compete to host innovative startups to secure and promote economic growth. However, because startups seem to be valued differently across countries, both researchers and policymakers must understand the factors determining the variability of early-stage startup valuations. This study therefore draws on institutional theory and conducts a fsQCA to analyze a sample of 1,251 startup valuations drawn from 13 countries between 2009 and 2016. Our findings show that a common law system together with high levels of innovativeness in a country explain high early-stage startup valuations. The second configuration leading to high startup valuations is characterized by favorable cultural circumstances in terms of low levels of uncertainty avoidance and high levels of collectivism, which in combination supposedly compensate for a civil law system. Two configurations explaining low startup valuations are a combination of a lack of innovativeness nationally, and unfavorable informal institutions (i.e., high uncertainty avoidance or low collectivism), regardless of the origins of a nation's legal system. The last configuration explaining low startup valuations is a combination of unfavorable informal institutions in terms of high uncertainty avoidance and low collectivism, alongside a civil law system.

3.1 Introduction

Entrepreneurship and VC are today international phenomena (e.g., Cumming, Fleming, & Schwienbacher, 2009). Not surprisingly, countries increasingly compete to host innovative startups: A fact underscored by the manifold recent initiatives around the world to attract and retain young and promising startups (e.g., Cumming, Sapienza, Siegel, & Wright, 2009; Ross & Woolsey, 2017; Technologist, 2017; Weller, 2017). A major reason for countries doing so is that startups spur productivity, efficiency by challenging the incumbent firms, and economic wealth, thereby contributing to a country's overall competitiveness (Cumming, Johan, & Zhang, 2014). Securing sufficient funding is often the impetus for the entrepreneurs

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of these startups to play a vital economic role (Aggarwal et al., 2012; Zheng et al., 2010). Particularly in the VC context, a startup's valuation determines how much financing can be raised, since a higher valuation implies a greater amount of funding (e.g., Cumming & Dai, 2011; Zheng et al., 2010). Indeed, Valliere and Peterson (2007) provide empirical evidence that valuation is the primary criterion for entrepreneurs seeking VC funding. Intriguingly, expert reports observe significant cross-country differences with regard to the level of early-stage startup valuations (EY, 2015; KPMG, 2015), implying that startup valuations might be shaped by country-specific conditions. Consequently, countries where startups tend to receive lower valuations might fear losing out to high valuation countries. Therefore, unraveling the drivers affecting the valuation of startups across countries is especially relevant to those interested in fostering a country's growth.

As economic activity (North, 1990), entrepreneurship (Bruton, Ahlstrom, & Li, 2010; Cuervo, 2005) and more specifically VC activity (Bruton, Fried, & Manigart, 2005; Li & Zahra, 2012; Wright et al., 2005) are embedded in the institutional context where entrepreneurial activities take place, presumably also valuations of early-stage startups are determined by the institutional setting. Moreover, as innovation is related to VC investments (e.g., Hirukawa & Ueda, 2011; Schertler & Tykvová, 2011) a country's innovativeness should also be considered when exploring the institutional drivers of early-stage startup valuations in the VC context. However, prior research has neglected to investigate how the origins of a nation's legal system, culture, and innovativeness combine to affect the valuation of startups, despite the importance of both researchers and policymakers comprehending the underlying drivers of the observed differences in valuation (Cumming & Dai, 2011; Zheng et al., 2010). We address this academic void by adopting a configurational approach to study the research question of which combinations of legal origin and culture in conjunction with a country's innovativeness explain high startup valuations across countries.

To serve its purpose, this study employs a sample drawn from the VC database VentureSource of 1,251 startups from 13 countries with post-money valuations between 2009 and 2016. We apply fsQCA (Ragin, 1987, 2008) to explore how the origins of a nation's legal system and culture together with its innovativeness affect high and low median post-money valuations for early-stage ventures. Overall, this study contributes to the literature in three ways: First, it sheds further light on the factors influencing startup valuation against the backdrop of institutional theory, demonstrating that the national differences of institutions and

innovativeness affect the valuations of early-stage startups (Cumming & Dai, 2011; Zheng et al., 2010). Second, the findings show that two configurations, a common law system in conjunction with high innovativeness, and a civil law system alongside favorable cultural conditions, lead to high early-stage startup valuations. Third, our results can help to explain anecdotal evidence suggesting that startups do not simply relocate to countries where they can achieve the highest valuation in the first round, but rather to high valuation countries that have a common law system in combination with an innovative environment where startups might have a better chance of fulfilling their potential in the long term.

The remainder of the paper proceeds as follows: Section 3.2 reviews prior literature focusing on the influence of institutional theory as well as a country's innovativeness on VC and IPO activity, and then seeks to link those findings to the valuation of early-stage startups. Section 3.3 describes the sample, data, and analytical approach, outlining the appropriateness of applying fsQCA to the paper's underlying research question. In Section 3.4 the study's main findings are presented. Section 3.5 discusses the paper's key findings, its implications and outlines avenues for future research. Section 3.6 concludes.

3.2 Linking institutional theory and startup valuation

Research seems to have largely neglected to explore if and if so, how institutions impact the valuations of early-stage startups in the VC context, underscoring the paucity of research in this field (e.g., Cumming & Dai, 2011). Interestingly, Wright et al. (2004) scrutinize how institutions influence VC investors' choice of a specific startup valuation method. Karsai et al. (1998) also find considerable differences in the applied valuation approaches focusing on emerging markets represented by Hungary, Poland and Slovakia. To extend this research, we examine the actual valuations VCs assign to startups, because in light of the allocation of financial resources to early-stage startups around the world, the final valuation must be considered the decisive point. In view of this, it is thus of paramount importance to understand the underlying determinants affecting startup valuations (e.g., Zheng et al., 2010). In fact, in his literature review on the determinants of startup valuation in the VC context Köhn (2018) points out that scholars should study the influence of the institutional setting on startup valuations. This paper therefore aims to address this gap by drawing on institutional theory and a configurational approach.

3.2.1 Formal institutions and startup valuation

Prior research has stressed the relevance of institutions for VC (e.g., Armour & Cumming, 2006; Batjargal & Liu, 2004; Broughman & Fried, 2012; Bruton et al., 2005; Cumming & Walz, 2010; Li & Zahra, 2012; Nahata, Hazarika, & Tandon, 2014; Wright et al., 2005). Generally, institutions are understood to be part of the rules of the game and may be either formal or informal (North, 1990). Formal institutions describe the political, economic, and contractual rules that shape and govern interactions and hence conduct within an economy (North, 1990; Simón-Moya, Revuelto-Taboada, & Guerrero, 2014). Formal institutions play several roles in startup valuations. For one, formal institutions have to reassure VC investors that the valuation of the startup is justified and fair in light of its future prospects (Engelen & van Essen, 2010; Lewellyn & Bao, 2014). Accordingly, formal institutions are ascribed the task of reducing transaction costs stemming from incomplete information (Li & Zahra, 2012). Since startups usually have limited history and negative earnings, a startup valuation is characterized by omnipresent uncertainty and information asymmetry (e.g., Amit, Brander, & Zott, 1998; Douglas et al., 2014; Sievers et al., 2013). This in turn makes it extremely challenging for VC investors to assign a valuation to an entrepreneurial enterprise (Li & Zahra, 2012). In this regard, Engelen and van Essen (2010) provide empirical evidence that the extensive presence of formal institutions reduces the degree of underpricing of IPOs. In the context of startup valuation, these findings support the argument that the presence of favorable formal institutions reduces investor uncertainty, and thus leads to higher valuations. In addition to this, high quality formal institutions can guarantee early-stage VC investors that their investment will not be expropriated and, in turn, that the cash flow distribution following a successful exit of their investee will be conducted fairly (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 2002; Lewellyn & Bao, 2014). High quality formal institutions hence reassure VCs at the time of their initial investment that they will be able to harvest the additional value that accrues to a startup over its lifetime. Indeed, La Porta et al. (2002) find that in the case of publicly listed firms a better legal framework strengthens investors' confidence and hence leads to a higher valuation. Moreover, formal institutions not only have to regulate and spur investor behavior, but also have to regulate the behavior of entrepreneurs. Indeed, as entrepreneurs want to participate in the value they create, startup valuation is directly linked to entrepreneurs' motivation, as it determines how many shares and thus what degree of control entrepreneurs must assign to investors (Hsu, 2004; Miloud et al., 2012). This means that formal institutions should also ensure that entrepreneurs are not being exploited by VCs offer-

ing a contrived low valuation. The aim has to be for entrepreneurs to have sufficient financial slack relative to their firm's quality to pursue and finance the growth opportunities necessary to reach their venture's full potential in the long run (Broughman & Fried, 2012; Lewellyn & Bao, 2014). In that sense, formal institutions should serve as a buffer against the threat that entrepreneurs have to give away significant control and cash flow rights early in the life of their venture due to low valuations (Lerner & Schoar, 2005). Furthermore, formal institutions can provide the grounds for and stimulate entrepreneurs to allocate their resources to productive entrepreneurship, that is, highly innovative activities (Baumol, 1996). Interestingly, Lerner and Schoar (2005) report that in the private equity context, common law countries have significantly higher venture valuations. Aggarwal and Goodell (2014) state that legal origin is an often-used proxy for investor protection, a statement that reflects common law countries typically being associated with better investor protection, which is a crucial factor in VC investments (e.g., Cumming, Fleming et al., 2009; Nahata et al., 2014). Overall, this suggests that formal institutions that better protect VCs and thus reduce investor uncertainty can form the basis for high early-stage startup valuations.

3.2.2 Informal institutions and startup valuation

In addition to highlighting the importance of malleable formal institutions, previous research has evidenced how informal institutions affect successful VC activity (e.g., Li & Zahra, 2012; Nahata et al., 2014). Informal institutions are difficult to define as the term refers to the culture, norms, values, beliefs, and underlying assumptions that shape a society (North, 1990). For example, Dushnitsky (2014) finds a significant connection between various cultural dimensions raised by Hofstede (2001) and startup valuation. In view of this, understanding the leverage national culture has over startup valuation, and in particular its interplay with a country's form of legal system and innovativeness, is of utmost importance. That said, we focus only on the cultural dimensions of Hofstede (2001) we consider relevant for early-stage startup valuations in the VC context. Research by Li and Zahra (2012) and Antonczyk and Salzmann (2012) offers appropriate reference points for the relevant cultural dimensions, as both rely on the cultural dimensions of uncertainty avoidance and collectivism. In particular, Li and Zahra (2012) show that uncertainty avoidance and collectivism affect VC activity, arguing that these two cultural dimensions are closely related to the uncertainty and information asymmetries underlying VC investments. As mentioned above, high uncertainty and information asymmetry are inherent factors impacting early-stage startup valuations in

the VC context (e.g., Douglas et al., 2014; Miloud et al., 2012). Consequently, we draw on these two cultural dimensions of Hofstede (2001) to study the relevance of uncertainty avoidance and collectivism for early-stage startup valuations in the VC context. Below we discuss each dimension's expected impact on early-stage startup valuations.

Uncertainty avoidance considers the level to which uncertainty is tolerated within a society and thus indicates its readiness to accept risk taking (Hofstede, 2001). Since early-stage startup valuation in the VC context is marked by significant uncertainty (e.g., Douglas et al., 2014; Miloud et al., 2012; Sievers et al., 2013), uncertainty avoidance is expected to influence the valuation of early-stage startups. More specifically, VC investors in countries characterized by a preference for avoiding uncertainty are likely to demand a higher risk premium as compensation for the risk taken; which in turn leads to lower startup valuations (Fidrmuc & Jacob, 2010; Li & Zahra, 2012). However, Manigart et al. (2002) find that in Belgium and France, which score high in the uncertainty avoidance dimension, VCs require lower returns for their investments, which ceteris paribus would result in higher valuations. VCs in the USA and the UK, which have low levels of uncertainty avoidance, on the other hand, require higher returns which would ceteris paribus lead to lower valuations. Nevertheless, Antonczyk and Salzmann (2014) in an empirical study of 834 listed companies across 47 countries find a negative relationship between uncertainty avoidance and firm value. The finding again supports the argument that in the context of startup valuations, low uncertainty avoidance, and thus a greater willingness to take risk, is mirrored in higher early-stage startup valuations.

Collectivism refers to how important it is to individuals that they are part of a group (Hofstede, 2001). Interestingly, Li and Zahra (2012) find that collectivism has a negative impact on VC activity. Similarly, Antonczyk and Salzmann (2012), who link the cultural dimension of individualism (i.e., the opposite of collectivism) with over-optimism, argue that individualism stimulates both the demand for and supply of VC. As greater capital inflows into a market lead to increased startup valuations (Gompers & Lerner, 2000b; Inderst & Müller, 2004), collectivism might imply lower valuations. On the other hand, since the treatment of uncertainty plays a decisive role in early-stage startup valuations, one also should consider the cushion hypothesis of Hsee and Weber (1999) in this context. The cushion hypothesis suggests that collectivistic countries such as China with their strong in-group relationships are less risk-averse than individualistic countries like the USA, because individuals from collec-

tivistic societies can rely on their social ties when faced with financial risk and suffering. In the context of startup valuation, this implies that VC investors from collectivistic countries might apply a lower risk premium when investing in early-stage ventures. Indeed, Ding, Sun, and Au (2014) show that Chinese investors have a greater risk tolerance, which ceteris paribus should result in a lower risk premium and in turn higher startup valuation. In addition, people in collectivistic countries primarily rely on commitment and trust instead of on contracts (Tiessen, 1997). Accordingly, in the VC context, where trust and mutual cooperation between entrepreneurs and VC investors are core elements driving success (Cable & Shane, 1997; Shepherd & Zacharakis, 2001), the influence of a collectivistic culture could explain higher startup valuations. First, in a VC company–entrepreneur relationship that encourages trust building and thus the reduction of uncertainty, VCs might be inclined to apply a lower risk premium, ceteris paribus resulting in higher startup valuations (Douglas et al., 2014). Second, the first valuations of early-stage startups are usually the result of negotiations (Hsu, 2004). In turn, negotiation in collectivistic cultures is characterized by the prioritization of group goals, implying that VC investors might voluntarily accept higher valuations that favor the entrepreneurs (Cai, Wilson, & Drake, 2000). In fact, Batjargal and Liu (2004) find that stronger social ties lead to higher valuations in the Chinese VC context. The strong reliance on trust and networks accompanying high levels of collectivism might therefore compensate for weaker formal institutions (Ahlstrom & Bruton, 2006). In sum, we argue that with regard to startup valuations in the VC context, the level of collectivism is an important causal condition, and that in combination high levels of collectivism might rather be associated with high early-stage startup valuations.

3.2.3 Innovativeness and startup valuation

As a country's innovativeness might be linked with the institutional setting, researchers should take its prevalence into account alongside the form of the legal system and national culture when scrutinizing the institutional determinants of early-stage startup valuations across countries. Indeed, innovation and VC are inherently connected, because VC investors typically back startups from the high-technology industries, like the information technology sector, where innovation lies at the core of the business (e.g., Hand, 2005; Sahlman, 1990; Schertler & Tykvová, 2011). In that sense, Gompers and Lerner (1998) find a positive relation between R&D expenditures, particularly by industrial companies, and VC investments. Interestingly enough, there are two strands of research regarding the interrelation of VC activity

and innovation. The first strand of research concludes that VC activity spurs a country's innovativeness and thus its economic growth (e.g., Kortum & Lerner, 2000). The implication is that politicians could foster entrepreneurship by implementing efficient governmental VC initiatives (Cumming, 2007; Lerner & Watson, 2008). The second strand of research highlights the reverse causality; namely that innovation stimulates VC investments (e.g., Hirukawa & Ueda, 2011). In view of this, better access to VC increases entrepreneurs' funding options, which should also put them in a better position to negotiate higher valuations (Gompers & Lerner, 2000b; Inderst & Müller, 2004). Consequently, startups in highly innovative countries should also be assigned higher valuations.

In our research context, we consider startup valuation to be a complex combination of different conditions of the institutional setting and a country's innovativeness; underscoring that the applied analysis needs to account for various examples of interdependence.

3.3 Methods

3.3.1 Analytical approach

As implied above, the valuation of startups should be analyzed in light of the complex setting created by an interplay of legal origin, culture, and innovativeness in a country. Owing to this complexity, we refrain from traditional approaches relying on the concept of separability and linear cause and effect relationships, and instead take a configurational approach. More specifically, we apply fsQCA as developed by Charles Ragin (1987, 2000), which makes it posssible to reflect the complexity of startup valuations across countries by accounting for the causal asymmetry, the conjunctural causation, and the equifinality inherent in this topic. In fact, as outlined by Kraus et al. (2018) fsQCA is gaining prominence in the field of entrepreneurship due to the complexity it can capture. Taking causal asymmetry into account is necessary because this analysis aims to explore which combinations of institutional conditions explain high and low startup valuations across countries. As the same formal institutions can lead to diverging economic outcomes across countries (Li & Zahra, 2012; North, 1990), the use of fsQCA is particularly apt for our research design, since it allows us to illuminate and scrutinize manifold configurations leading to high and low early-stage startup valuations. In sum, we are interested in how the combination of legal origin and cultural conditions together with the innovativeness of a country can equifinally lead to the outcome of high or low valuations. Another characteristic of fsQCA that adds to its appropriateness for this study is

that outcomes and conditions are developed by calibrating uninterpreted measures. To do so, we apply the direct method of calibration, which entails the definition of anchor points based on the case knowledge or literature to mark full membership, non-membership, and the cross-over-point (Ragin, 2000).

3.3.2 Sample and outcomes

The analysis aims to examine two outcomes, namely high median post-money valuations of startups and low median post-money valuations of startups across countries. To construct our sample, we retrieve the data from VentureSource, which is a frequently used database in the research field of VC (e.g., Kaplan, Strömberg, & Sensoy, 2002). We consider the first professional VC investment rounds between January 2009 and April 2016 for which post-money valuations were available. We also follow Miloud et al. (2012) and focus on startups less than five years old at the time of the investment year. To construct a sample independent of a nation's natural resources, we focus on startups with a low share of immobile assets, supposing that certain industries are more likely to foster startups that spur a country's economic growth by targeting a global market (Cumming, Fleming, et al., 2009; Dushnitsky, 2014). Accordingly, we select startups operating in the information technology, consumer services, and business and financial services sectors. Overall, this results in an initial sample of 43 countries with 1,522 startups. In order to ensure a sufficient degree of representativeness, we follow Nahata et al. (2014) and exclude all countries with less than 15 post-money valuations available in the time period considered, leaving us with a final sample of 13 countries and 1,251 post-money valuations. An overview of the countries and their median post-money valuation is provided in Table 5.

To construct the required outcome of high and low startup valuations, the median valuations are calibrated based on prior research and case knowledge (Ragin, 2000). Based on the example given by Kaplan and Strömberg (2002), we define the threshold for non-members in high valuations, or in other words, full members in the set of low valuations at three million US dollars. The threshold for being full-members in the set of high valuations is set at nine million US dollars, as it presents a gap in the data separating the top valuation countries.

Table 5: Values per country, valuation in millions of US dollars, uncalibrated data

Country	Median post-money valuation	Uncertainty avoidance	Collectivism	Legal origin	Innovativeness
Canada	5.5	48	20	1	1.77
China	15.4	30	80	0	1.86
France	5.4	86	29	0	2.22
Germany	5.3	65	33	0	2.80
India	4.0	40	52	1	.81
Israel	8.0	81	46	1	4.06
Italy	2.6	75	24	0	1.25
Japan	7.3	92	54	1	3.40
Russia	5.0	95	61	0	1.15
Singapore	6.0	8	80	1	2.08
Spain	2.8	86	49	0	1.30
UK	5.0	35	11	1	1.69
USA	10.0	46	9	1	2.75

3.3.3 Causal conditions

The current study uses four conditions each constructed from secondary data from different sources to capture the presence of formal or informal institutions and the innovativeness of a country. Legal origin describes the formal institutions in an economy, two cultural dimensions describe the informal institutions, and a country's innovativeness can be understood as a result of the institutional framework. These factors in combination can serve to explain high and low early-stage startup valuations.

Legal origin. There are two main legal traditions shaping the formal institutions and policies in a country, one originating in a common law tradition and the other is based on a civil law tradition (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998). Formal institutions based on common law are associated with stronger protection and thus a more favorable environment for valuations as Lerner and Schoar (2005) provide empirical evidence for. In contrast, formal institutions based on civil law or socialist legal backgrounds are associated with

weaker legal enforcement and thus weaker valuations, as investors might have to include a premium to counter the risk of weak legal enforcement. In line with the majority of studies analyzing the quality of the legal system (e.g., Du & Vertinsky, 2011; Haxhi & Aguilera, 2017), we have constructed the condition legal origin which indicates whether the country's legal system is based on common law (1) or civil law (0). The data originate from La Porta, Lopez-de-Silanes, and Shleifer (2006).

Cultural dimensions. We construct two conditions embracing the informal institutions, namely uncertainty avoidance and collectivism. The data are retrieved from Hofstede (2001) for each country. Following Hsu, Woodside, and Marshall (2013) and Kuckertz, Berger, and Allmendinger (2015), the same membership criteria are used for both cultural dimensions, that is, values above 80 signify high membership and values below 20 signify non-membership.

Innovativeness. To construct a condition that captures the innovativeness of a country, we rely on the R&D spending relative to the GDP of a country, which is provided by the *World Bank* (http://data.worldbank.org). The approach follows previous work such as that of Schertler and Tykvová (2011). For each country, we construct the average of the R&D expenditure relative to the GDP from 2009 to 2014. The anchor point for full membership of the set of highly innovative countries is the average between the share of R&D expenditure relative to GDP of the one percent among the countries for which the data is available, and the value that the *World Development Indicators* define as high values, calculated as 3.17. Analogously, non-membership is marked at the average between the top 10 percent and the definition of lower middle values, calculated as 2.00.

Table 6 provides the descriptive statistics for the outcome and conditions as well as the applied calibration criteria. In addition, Table 5 also lists the uncalibrated values and scores for all countries.

Table 6: Descriptive statistics and calibration criteria

	Descriptive statistics		**Calibration criteria**		
	Mean	SD	Full member	Crossover	Non-member
Valuation in millions of US dollars	6.33	3.39	9	6	3
Uncertainty avoidance (Score 0-100)	60.54	27.78	80	50	20
Collectivism (Score 0-100)	42.15	23.57	80	50	20
Legal origin	.54	.50	Dichotomous (0 civil law, 1 common law)		
Innovativeness in % of GDP	2.09	.95	3.17	2.33	2.00

3.4 Results

To analyze which combinations of causal conditions are sufficient to explain high and low early-stage startup valuations, we set the frequency cut-off at one to ensure the inclusion of at least 80% of the cases, and the consistency cut-off at .80 (Ragin, 2008). The results of the fsQCA for high and low early-stage startup valuations are both presented in Figure 6.

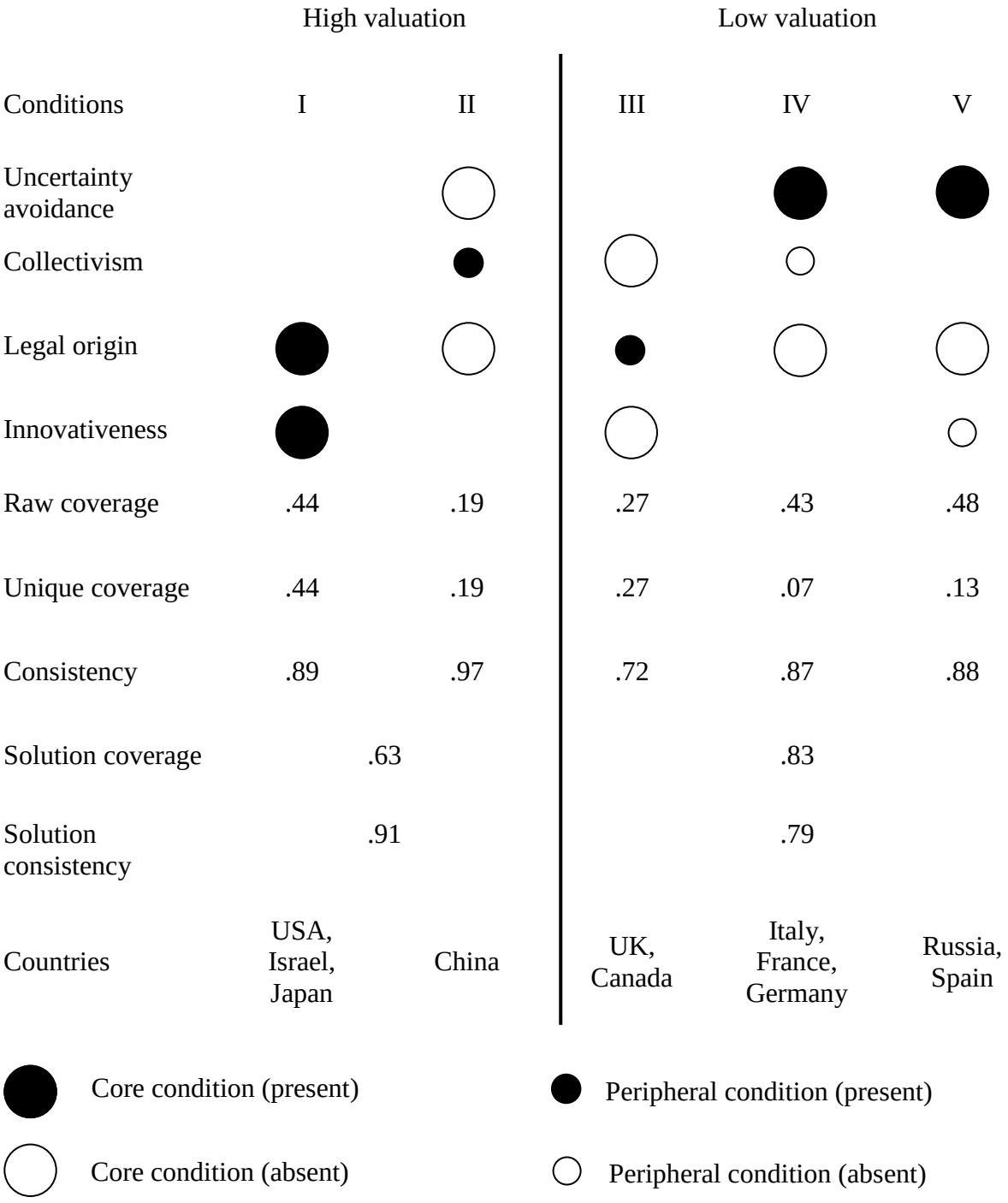
The left side shows the results for the sufficiency analysis of high early-stage startup valuations. Two configurations with a good consistency level, that is to what degree to which the subset relates to the outcome (Ragin, 2006), in combination explain 63% of the phenomenon high valuations, which is indicated by the solution coverage. Shaded circles signify the presence of a condition, whereas clear circles indicate that the causal condition is required to be absent. Blank spaces on the other hand indicate that the presence or absence of a condition does not matter. The size of the circle indicates whether the condition is core to the solution (large circle) or peripheral (small circle). Both configurations share the characteristic that no single causal condition is sufficient to explain high early-stage startup valuations, but that it is a combination of conditions. Configuration 1 explains high valuations with a formal framework marked by common law and high innovativeness in a country, such as in the USA, Israel, or Japan. Configuration 2, on the other hand, explains high valuations in China, through a

combination of formal and informal institutional conditions, that is, formal institutions operating under a civil law system in combination with low uncertainty avoidance, and high collectivism being a peripheral condition in this configuration.

The analysis of causal conditions explaining low valuations results in three configurations, which both together and individually have a good consistency level (solution consistency: .79) and coverage (solution coverage: .83). The three configurations are illustrated on the right-hand side of Figure 6. All configurations underscore the necessity of considering a combination of informal and formal institutional conditions. Configuration 3 explains low valuations in the UK and Canada with a configuration of low collectivism, a common law system, and low innovativeness. Configurations 4 and 5, on the other hand, share high levels of uncertainty avoidance and civil law being core to these configurations, and explain the low valuations. Configuration 4 also requires low levels of collectivism as a peripheral condition, such as are found in Italy, France, and Germany. Configuration 5, on the other hand, which refers to the low valuations in Russia and Spain, additionally requires a low level of innovativeness. When comparing the results of the analysis for high and low valuations, it is evident that the configurations explaining low valuations are not simply the mirror image of the configurations leading to high valuations, thus underlining the merit of applying a research method that accounts for causal asymmetry.

To check the robustness of our results, we ran additional analyses for different calibrations, which resulted in the same configurations with slightly varying consistency scores (Muñoz & Dimov, 2015). Furthermore, we have also accounted for the relevance of a country's financial markets, which might have an impact on early-stage startup valuations in the VC context across countries. Doing so involved adding a condition in the analysis for each country called market capitalization. To construct this condition, we used the 2009–2014 average of the market capitalization in a country over its GDP, retrieved from the *World Bank* (Haxhi & Aguilera, 2017). This approach produced similar results; but specifically, the inclusion of the financial market had no impact on the subset explaining high valuations. Similarly, Jeng and Wells (2000) did not find that IPOs have an impact on early-stage VC investments across countries.

Figure 6: Results for high and low early-stage startup valuations



Blank space: present or absent does not matter

3.5 Discussion

3.5.1 Implications

The goal of this study was to establish the missing link between the valuation of early-stage startups and institutional theory. Therefore, based on previous work scrutinizing the impact of the institutional setting on VC and IPO activity, we argue that startup valuations are also affected by the institutional environment they are embedded in. Specifically, we postulate that the interplay of a country's institutions together with its innovativeness shapes the level of early-stage startup valuations.

Our configurations underpin the notion that across countries the same formal institutions in terms of legal origin can lead to different economic outcomes represented by high and low early-stage startup valuations (Li & Zahra, 2012). Our findings show that a legal framework based on common law in combination with high innovativeness leads to high early-stage startup valuations. In this configuration, formal institutions in terms of a common law system seem to mitigate the uncertainties and information asymmetries entailed in VC transactions, and thus might promote investor confidence in terms of assigning higher valuations. However, at the same time our findings show that a common law system alone does not lead to high startup valuations, as in the case of Configuration 3 for Canada and the UK (which have a common law system, but low levels of innovativeness and collectivism). In that sense, the combination of a common law system with high levels of innovativeness in the country, as is the case in the USA, Israel, or Japan explain high early-stage startup valuations. Interestingly, for this path national culture is irrelevant. On the one hand, this result is striking as previous research relying on regression analysis finds an impact of national culture on startup valuations (Dushnitsky, 2014) and VC activity (e.g., Li & Zahra, 2012). Nevertheless, our results emphasize the advantage of a configurational approach unraveling the various paths of high and low early-stage startup valuations, underscoring that at the backdrop of institutional theory startup valuations are shaped by the interplay of a country's legal origin, culture and innovativeness.

Second, we identify another configuration explaining high early-stage startup valuations. This configuration requires low levels of uncertainty avoidance and high levels of collectivism in combination, presumably to compensate for formal institutions with weaker investor protection rights flowing from a civil law system. The cultural dimensions required to

explain high valuations along this path are coherent with the proposition with regard to the informal institutions we developed based on the extant literature (Ahlstrom & Bruton, 2006; Antonczyk & Salzmann, 2014; Ding et al., 2014; Hsee & Weber, 1999; Lewellyn & Bao, 2014; Li & Zahra, 2012). This path represents high valuations in China (see Gu, Qian, & Lu, 2018 for a discussion of the relationship between entrepreneurship and VC in China). An example of a multi-billion-dollar-valued Chinese startup is Didi Chuxing. Interestingly, Didi Chuxing directly competes with the multi-billion-dollar startup Uber from the USA. The high valuation Didi Chuxing has received might be viewed as a signal, or posturing from the Chinese market that they are able to compete with US startups and thus serves to emphasize China's economic competitiveness. Indeed, as outlined by White, Gao, and Zhang (2005) the Chinese government has traditionally feared foreign dominance and moreover plays a paternalistic role in its national VC system by steering investments into the sectors it prioritizes. This allows us to speculate that the combination of low uncertainty avoidance, high collectivism, and a civil law system might be a requirement or a favorable environment for national posturing.

Third, from a startup perspective, the first path, which requires a common law system and high levels of innovativeness might be the more attractive configuration. A country with efficient formal institutions and high levels of innovativeness might not only be an attractive location for the first professional VC round valuation, but due to knowledge spillovers also likely for the subsequent development in terms of opportunity recognition and exploitation, further investment rounds, and eventually for exit options (e.g., Acs, Braunerhjelm, Audretsch, & Carlsson, 2009; Jaffe, Trajtenberg, & Henderson, 1993). This is also emphasized by the results of the configurations explaining low startup valuations. Accordingly, a low level of innovativeness is an integral part of low startup valuations when in combination with either low collectivism and a common law system or high uncertainty avoidance and a civil law system. In this regard, Configuration 4 is interesting as it shows that high uncertainty avoidance, low collectivism, and a civil law system, independent of a country's innovativeness lead to low early-stage startup valuations. When considering the low valuation countries as a group, it becomes obvious that many of them are European countries, while no European country is represented in a high valuation configuration. Startups from low valuation countries like Germany, Spain, or the UK might recognize that they remain below their full potential in terms of financial valuation in their home country, and might thus be more inclined to relocate to high valuation countries. This, in turn, would lead to a brain drain from these

countries that could adversely affect the countries' economic competitiveness in the longer term. Intriguingly, the European popular science magazine Technologist has recently published an article on the brain drain of European startups to the USA, remarking that "whole new areas of emerging technology are at risk of being plucked out of Europe and developed under US control instead" (Technologist, 2017). Indeed, the case of the startup Dedrone which relocated from Germany to the USA to benefit from, among other things, better funding conditions and a higher startup valuation puts this into perspective very well (Hajek, 2016). To tackle the brain drain issue, the article mentions that many experts deem "a change of culture and attitudes" necessary to pave the way for a European Amazon or Google (Technologist, 2017). This becomes evident when comparing Configuration 2 and Configuration 4 (represented, for instance, by China versus Germany): Both configurations are marked by a civil law system, but have the mirror image of the respective cultural conditions. To compensate for these unfavorable cultural conditions and to simultaneously avoid brain drain and attract innovative startups from other countries in the long term, the experts in the article call for more government involvement in financing startups; which at the same time should take place amid less risk-averse conditions, which in turn would imply financing startups at higher valuations.

3.5.2 Limitations and future research

This study has three limitations that suggest valuable paths for future research. First, we link the influence of institutions and innovativeness on early-stage startup valuation with the levels of a particular country. Indeed, Mäkelä and Maula (2008) observe that local VCs usually invest first and that foreign VCs rather participate in later financing rounds. This link notwithstanding, it is well-known that VC investors invest on a global scale, meaning that VC investors also invest in ventures headquartered in another country (Schertler & Tykvová, 2011; Wright et al., 2005) and that not only the portfolio company's location matters, but also the fund location (Dimov & Murray, 2008). Therefore, it would be fruitful for future research to analyze how institutional and cultural distance might affect startup valuation in the VC context (e.g., Li, Vertinsky, & Li, 2014; Nahata et al., 2014). Second, like Li and Zahra (2012) we assume that there is no difference in quality of startups. Hence, we encourage scholars to benchmark our findings by specifically taking startup quality into account. In a similar vein, we suppose that value equals price, and moreover that based on the efficient market hypothesis, "price is the best estimate of the intrinsic value of the firm" (Cumming &

MacIntosh, 2000, p. 36). Yet, Cumming and MacIntosh (2000) also point out that since in the VC context, investors must rely on their own valuation skills, the valuation risk of startup companies is more severe than that pertaining to their public peers. Accordingly, it would be interesting to analyze how the institutional framework affects the valuation capability of VC investors, which Yang et al. (2009) define as the ability to avoid overvaluation. Third, although the calibration of measures is understood as a strength of QCA, at the same time it can be considered a weakness and arbitrary, especially if the anchor points are not determined externally from the data (Schneider & Wagemann, 2012). Nevertheless, we encourage future research to apply fsQCA when conducting across-country studies of the determinants of VC activity in general and startup valuation in particular through different theoretical lenses.

3.6 Conclusion

This paper sought to establish the missing link between the valuation of early-stage startups in the VC context, a country's institutions, and its innovativeness. It is thus to the best of our knowledge the first study exploring which combinations of formal and informal institutions in conjunction with a country's innovativeness affect early-stage startup valuations. It therefore sheds light on the factors influencing the valuation of startups in the VC context (Cumming & Dai, 2011; Köhn, 2018; Zheng et al., 2010). Overall, our results underscore that the origin of a country's legal system, its culture, and its innovativeness play a crucial role in startup valuations in the VC investment context. The results also emphasize the importance of a configurational perspective when studying the phenomenon of high and low early-stage startup valuations from an institutional perspective across countries.

4 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.

4.1 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 (Caldbeck, 2015; Dushnitsky & Lenox, 2006; Gompers & Lerner, 2000a; NVCA, 2016). According to the MoneyTree Report published by the National Venture Capital Association (NVCA) and PricewaterhouseCoopers

[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.

(PwC), CVCs participated in 905 transactions representing 21% of all US VC 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, 2000a; Hellmann, 2002; Heughebaert & Manigart, 2012; Masulis & Nahata, 2009). The empirical evidence, however, is mixed; for instance, Gompers and Lerner (2000a) 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 (Dushnitsky & Lenox, 2006; Gompers & Lerner, 2000a). 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 (McKenny, Short, & Payne, 2013; Short, Broberg, Cogliser, & Brigham, 2010). 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 (2000a), 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

(2000a) 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, Phelps, and Kotha (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 4.2 reviews the current literature addressing distinctive CVC investment motives, and reflects the paper's underlying motivation. Section 4.3, 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 4.4, 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 4.5 discusses the results and Section 4.6 draws a conclusion.

4.2 Literature review and motivation

Gompers and Lerner (2000a) 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. Interesting-

ly, 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 interaction 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.

4.3 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.

4.3.1 Data and sample design

To construct a sample of CVCs unbiased by cross-country differences, like the institutional or cultural environment (Wright et al., 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 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 could capture potential valuation impacts in light

[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).

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 et al., 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; Mullane, 2002; Pearce & Fred, 1987). 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).

4.3.2 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 (Krippendorff, 2004; Weber, 1990), 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 (Krippendorff, 2004; Morris, 1994; Rosenberg, Schnurr, & Oxman, 1990). 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 limited partners (e.g., Kuckertz et al., 2015), IVCs (e.g., Fried, Bruton, & Hisrich, 1998) and corporate investment vehicles has proved reluctant to respond to prior surveys (Hill & Birkinshaw, 2014; Maula, Autio, & Murray, 2003; Maula et al., 2005; Proksch et al., 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 Chesbrough (2002), Dushnitsky and Lenox (2006), Ernst, Witt, and Brachtendorf (2005), Weber and Weber (2005) and Winters and Murfin (1988).

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., Brigham, Lumpkin, Payne, & Zachary, 2014; McKenny, Short, & Payne, 2013; Moss, Short, Payne, & Lumpkin, 2011; Podsakoff, MacKenzie, & Podsakoff, 2016; Vracheva, Judge, & Madden, 2016; Zachary, McKenny, Short, & Payne, 2011). 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; Moss et al., 2014; Wolfe & Shepherd, 2015; Zachary, McKenny, Short, & Payne, 2011) and helps to forge links between theoretically driven research branches and more practically oriented ones (Short et al., 2010; Van De Ven & Johnson, 2006). Table 7 reports the full lists of all deductively and inductively derived words.

Table 7: 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.

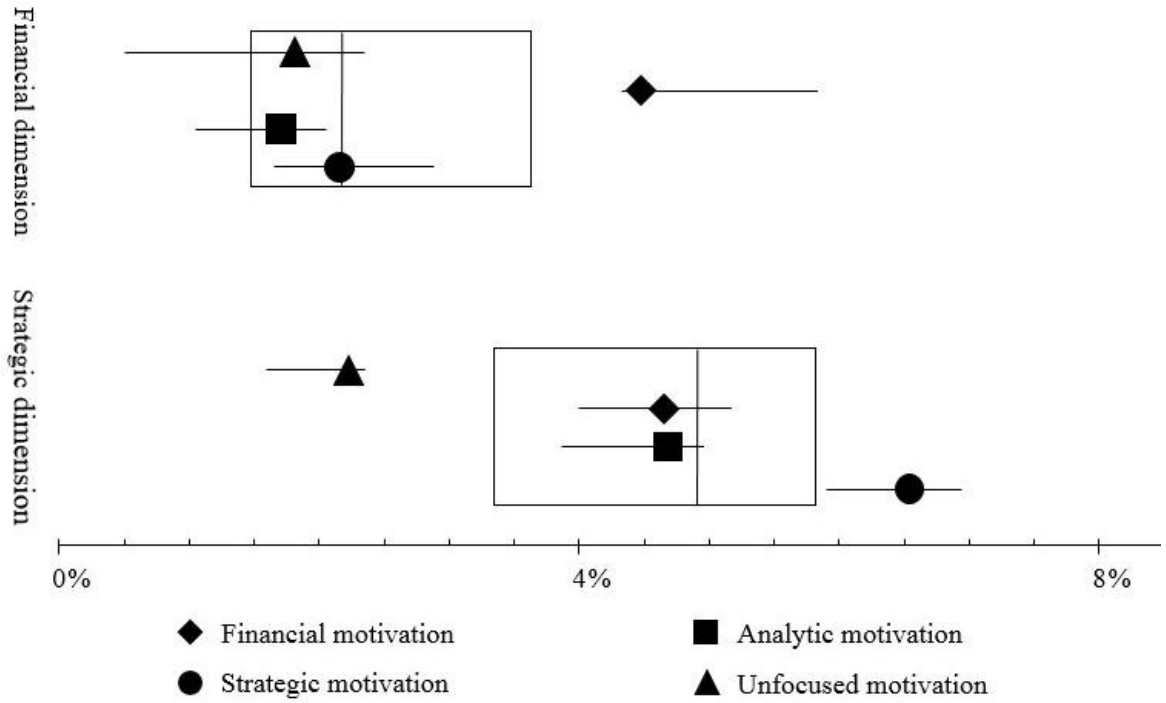
After merging the deductively and inductively derived word lists, we subsequently relied on *LIWC2015*, a powerful computerized text analysis tool introduced by Tausczik and Pennebaker (2010), to extract the variables of interest. In addition, we followed Jegadeesh and Wu (2013) and omitted words that 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 ($r = .651$; $p \leq .01$).

4.3.3 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 subsequent-

ly 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 8).

4.4 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*.

Table 8: 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.	(…) attractive financial return potential commensurate to the risk profile of the investment.	Our approach reflects our understanding of the limitations of both traditional corporate and financial venture capital models.	(…) provides seed, venture, and growth-stage funding to the best companies not strategic investments (…).
	(…) focuses on emerging (…) technology companies that have the potential to provide long-term strategic growth options (…).	We invest for financial return (…).	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 (…).	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.

4.4.1 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; Ivanov & Xie, 2010; Maula et al., 2005; Zu Knyphausen-Aufseß, 2005). 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 (Keil, 2000; Maula, 2007; Winters & Murfin, 1988). 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, 2005b). Similarly, Dushnitsky and Lenox (2005a) 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, Alvarez-Garrido and Dushnitsky (2016), Chemmanur, Loutskina, and Tian (2014) and Park and Steensma (2013) 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 (2000a) 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, 2000a; 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 (Hill & Birkinshaw, 2014; Maula et al., 2005). 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, 1989; 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.

4.4.2 Measures and descriptive statistics

We obtained the data underlying the analysis from the sample described in Section 4.3.1 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 9 provides an overview of the underlying variables and their respective definitions.

Table 9: 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

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., Block et al., 2014; Yang et al., 2009). 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 Charles (2002) and the extended version of Klobucnik and Sievers (2013).[17] 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 (Gaba & Meyer, 2008; Inderst & Müller, 2004; Zheng et al., 2010) and a higher level of interorganizational knowledge spillover (Jaffe et al., 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 10 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

[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).

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.

4.4.3 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., Misangyi, Elms, Greckhamer, & Lepine, 2006; Van Der Vegt, Van De Vliert, & Huang, 2005) 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).

Table 10: Descriptive statistics and intercorrelations

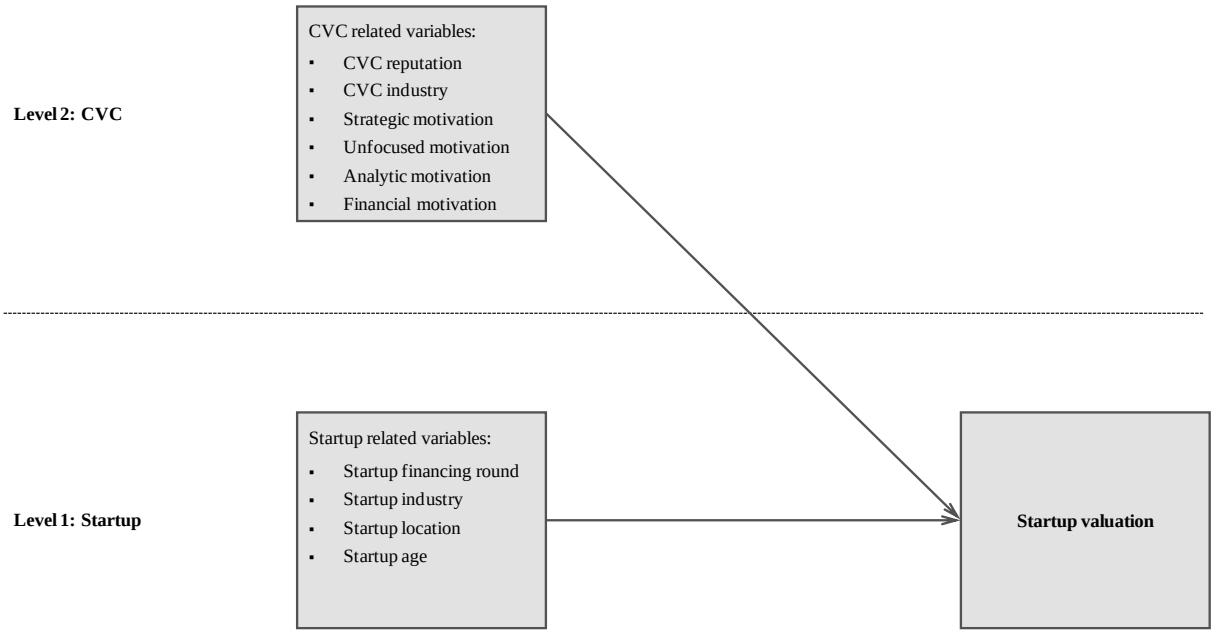
Variable	Max	Mean	SD	1.	2.	3.	4.	5.	6.
Level 1: Startup level									
1. Startup valuation [m]	4,500	263.67	663.40	- / -					
2. Startup financing round	16.00	3.62	2.46	.44***	- / -				
3. Startup industry	1.00	.72	.45	-.13	-.18*	- / -			
4. Startup location	1.00	.76	.43	.03	-.14†	.04	- / -		
5. Startup 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.

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.

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.

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). 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 11). 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 et al., 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):

<u>Level 1 Model:</u>

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

<u>Level 2 Model:</u>

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

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + u_{2j}$$

$$\beta_{3j} = \gamma_{30} + u_{3j}$$

$$\beta_{4j} = \gamma_{40} + u_{4j}$$

4.4.4 Results

The findings of the HLM framework are presented in Table 11. 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 11). 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 11: 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		
$R^2_{Level\ 1}$		.593	.647
$R^2_{Level\ 2}$		.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.

4.5 Discussion

4.5.1 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, 2000a; 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*.

4.5.2 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, McKenny, Short, & Payne, 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 et al., 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 (Dushnitsky & Lenox, 2006; Gompers & Lerner, 2000a; McNally, 1995). 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, Autio, & Murray, 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.

4.6 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.

5 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 CVC 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.

5.1 Introduction

In 2016, US corporations conducted 317 domestic VC-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 CVC 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 (Dushnitsky & Lenox, 2005b; Keil, 2004). There is a growing body of literature examining external corporate venturing (CV) 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, Maula, Schildt, & Zahra, 2008; Titus, House, & Covin, 2017; Tong & Li, 2011). 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, Stettner, & Tushman, 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 E/E has received attention in the mergers and acquisition literature (e.g., Phene, Tallman, & Almeida, 2012) as well as the CVC research stream (e.g., Hill & Birkinshaw, 2008; Schildt, Maula, & Keil, 2005). 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 US 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 corpo-

rate 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 exploration on CVC acquisition is reduced when corporate mothers and startups operate in related product markets, while the opposite holds true for their degree of exploitative orientation. 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.

5.2 Theory and hypotheses

5.2.1 CVC

Research on CVC—that is, direct minority equity investments in startups by large and established corporations through a corporate investment vehicle (Dushnitsky & Lenox, 2006; Gompers & Lerner, 2000a)—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". Specifically, 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 (Keil, 2000; Keil, 2004; Maula, 2007; Narayanan et al., 2009; Winters & Murfin, 1988). How those CVC activities are structured depends on the underlying motivation of the corporate mother, a topic that has received widespread attention in the CVC literature (Chesbrough, 2002; Dushnitsky & Lenox, 2006; Ernst et al., 2005; Röhm et al., 2018; Weber & Weber, 2005; Winters & Murfin, 1988). 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 limited partner in pooled and dedicated funds, typically managed by a third party such as IVCs (Keil, 2000; McNally, 1995). 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 acquisi-

tions 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 the investment is occurring in the context of 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 a corporate mother's innovation rate (Dushnitsky & Lenox, 2005b). However, acquisitions are also commonly said to be used to deliver taxation benefits (Hayn, 1989), create economic value (Chatterjee, 1986), or to gain access to customers, markets, and technologies (Salter & Weinhold, 1978).

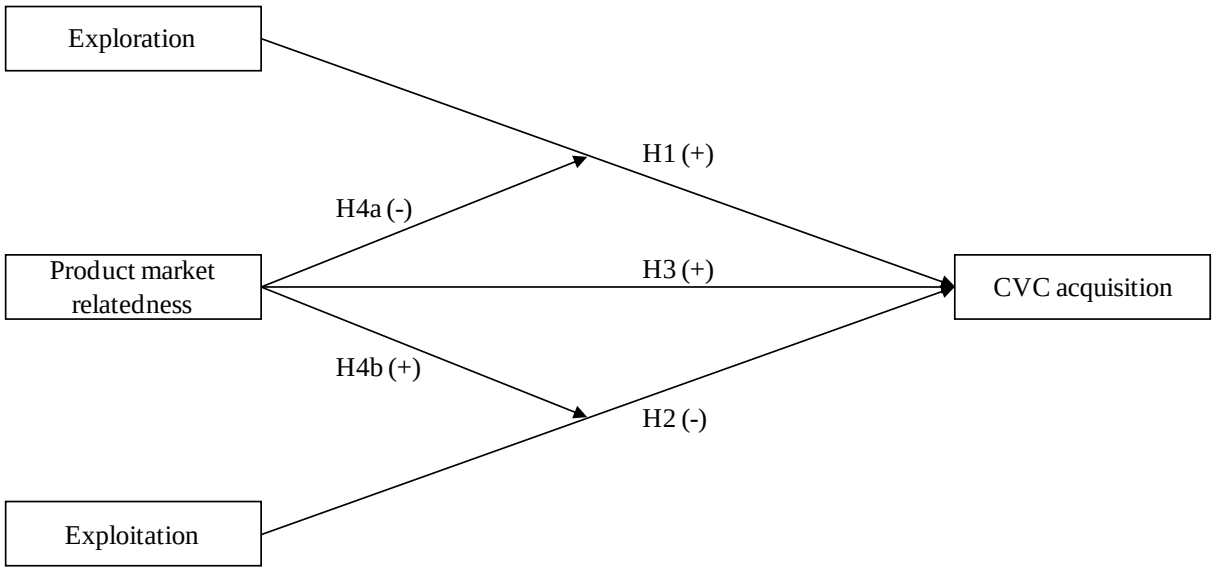
Astonishingly, only a few articles shift the independent view of the external venturing modes to a sequential one, where CVC vehicles are used as a strategic instrument to materialize startup investments into an acquisition by the corporate mother at a later point in time (Benson & Ziedonis, 2010; Dimitrova, 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 negatively associated with abnormal returns.

5.2.2 Exploration and exploitation in the context of CVC acquisition

This article, 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., Titus et al., 2017; Wadhwa & Basu, 2013) that 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, Stettner, & Tushman, 2010). Following previous research (e.g., Lubatkin, Simsek, Ling, & Veiga, 2006; Sirén, Kohtamäki & Kuckertz, 2012; Titus et al., 2017), we consider both orientations to be 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 exploration to external CV modes in a comparative setting (e.g., Schildt et al., 2005; Titus et al., 2017; Wadhwa & Basu, 2013). 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, 2005b), 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 (Lavie et al., 2010; Lubatkin et al., 2006) 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, 2005b; Keil et al., 2008; Souitaris & Zerbinati, 2014), or through the presence of a CVC investment manager on a startup's board (Anokhin, Peck, & Wincent, 2016). 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, because 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.

5.2.3 The moderating role of product market relatedness

The topic of product market relatedness as it affects 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, in 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 to exploration are more inclined to generate knowledge distant from their existing resource base; and thus seek 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) consider exploitation "the use and development of things already known". Phene et al. (2012) indicate 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 degree of 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.

5.3 Methodology

5.3.1 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 VC (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 US VC 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 USA 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, VCs, 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 USA, 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 general partners 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 IVCs, 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. Owing 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 12 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, repre-

senting 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 12: 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%

5.3.2 Measures

Dependent variable. Owing to the 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 13 for an overview of the variables employed and their underlying definitions).

Table 13: 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

Independent variables. The first independent variable is a proxy for product market relatedness as suggested by several previous publications (e.g., Dushnitsky & Shaver, 2009; Farjoun, 1998; 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 most of the corporate mothers (47%) are related to the manufacturing industry, including high-technology firms like, Intel, General Electric, Cisco or Advanced Micro Device. To operationalize the explorative and exploitative orientation of corporate mothers, we draw on the work of Moss et al. (2014). We rely on CATA (McKenny et al., 2013; Short et al., 2010) 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; Hill & Birkinshaw, 2008; Phene et al., 2012; Schildt et al., 2005; Sirén et al., 2012), the advantages using predefined word lists in conjunction with CATA are threefold. 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, McKenny, Short, & Payne, 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 (Dushnitsky & Lenox, 2006; Gompers & Lerner, 2000a) and merger and acquisition activities (Bauer & Matzler, 2014; Harford, 2005) 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., Benson & Ziedonis, 2009; Chemmanur et al., 2014; Dushnitsky & Lenox, 2005b). 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 overevaluate 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 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.

5.4 Results

Table 14 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).

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 15. 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 dependent variable's variance (Nagelkerke, 1991) and shows a strong increase when compared to the pseudo R^2 of 29.8% in the baseline model.

Table 14: 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. *** $p \leq .001$; ** $p \leq .01$; * $p \leq .05$; † $p \leq .1$.

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, significant and negative (β = -2.11, p = .018). Analogously, Model VI includes the interaction term of exploitation and product market relatedness and shows a significant and positive coefficient (β = 1.83, p = .013). Model VII represents the full model and serves as benchmark to test our hypotheses. We find a significantly positive effect of product market relatedness on CVC acquisition, thus supporting Hypothesis 3. 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). Hypothesis 2, on the other hand, predicted that the degree of exploitative orientation of a corporate mother will reduce 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). Hypothesis 4a suggested that the product market relatedness between corporate mother and startup negatively moderates the effect of exploration on CVC acquisition. The interaction term of exploration and product market relatedness is negative and significant, thus providing evidence for Hypothesis 4a (β = -1.65, p = .071). Finally, we find a positive and significant coefficient for the interaction term of exploitation and product market relatedness, implying that Hypothesis 4b is supported (β = 1.51, p = .049).

Table 15: 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. *** $p \leq .001$; ** $p \leq .01$; * $p \leq .05$; † $p \leq .1$.

In addition to the above, we conducted extensive 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.

5.5 Discussion

There is an increasing volume 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 seeks 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 to scrutinize 901 unique CVC triads that consist of corporate mother, CVC unit, and startup. Of these 901 transactions 124 were 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.

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 holisti-

cally taking into account all three parties involved in the CVC triad. The results therefore 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., Dimitrova, 2015; Dushnitsky & Lavie, 2010). 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 the interplay between E/E into perspective (Gupta, Smith, & Shalley, 2006), implying 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 might mean 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.

5.6 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 US context, meaning that startups, corporate mothers, and CVC vehicles were all headquartered in the USA. However, the explorative and exploitative orientation of a corporate mother might differ across different countries and cultures (Cui, Walsh, & Zou, 2014) and might also vary in 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, a probable fruitful avenue would involve examining if startups with pre-existing relationships with corporations, particularly in terms of receiving CVC investments, are more likely to be acquired by those corporations 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 per-

spective. Interestingly, Benson and Ziedonis (2010) found that CVC acquisitions are associated with shareholder value destruction. To address this puzzle, 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 affects a corporation's financial performance (Sirén et al., 2012; Uotila et al., 2009).

5.7 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. Accordingly, 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 are more likely to acquire 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 a whole, our results emphasize the important link between E/E and CVC acquisition and thereby illuminate promising paths for future work.

6 Conclusion

The introduction section of this dissertation highlighted that when entrepreneurs draw on VC funding, valuation and exit of a startup are integral parts of the entrepreneurial process. Subsequently, this dissertation presented one systematic literature review and three empirical studies seeking to fulfill the overarching goal to further the understanding of the factors affecting startup valuations and entrepreneurial exit in the VC context. In this regard, the dissertation also took a special focus on the role of CVCs concerning the valuation and acquisition of startups, because CVCs make different value-adding contributions to those of IVCs, (Maula et al, 2005), invest for different reasons (e.g., Dushnitsky & Lenox, 2006; Röhm et al., 2018), and potentially with the intention of acquiring a startup (Benson & Ziedonis, 2010; Kaji & Peltz-Zatulove, 2015; Siegel et al., 1988). In Section 6.1, the main results of the presented studies and their contributions are reviewed, and the dissertation's overarching contributions to the field of entrepreneurial finance are outlined. Section 6.2 then illustrates promising paths for future research, and Section 6.3 closes the dissertation.

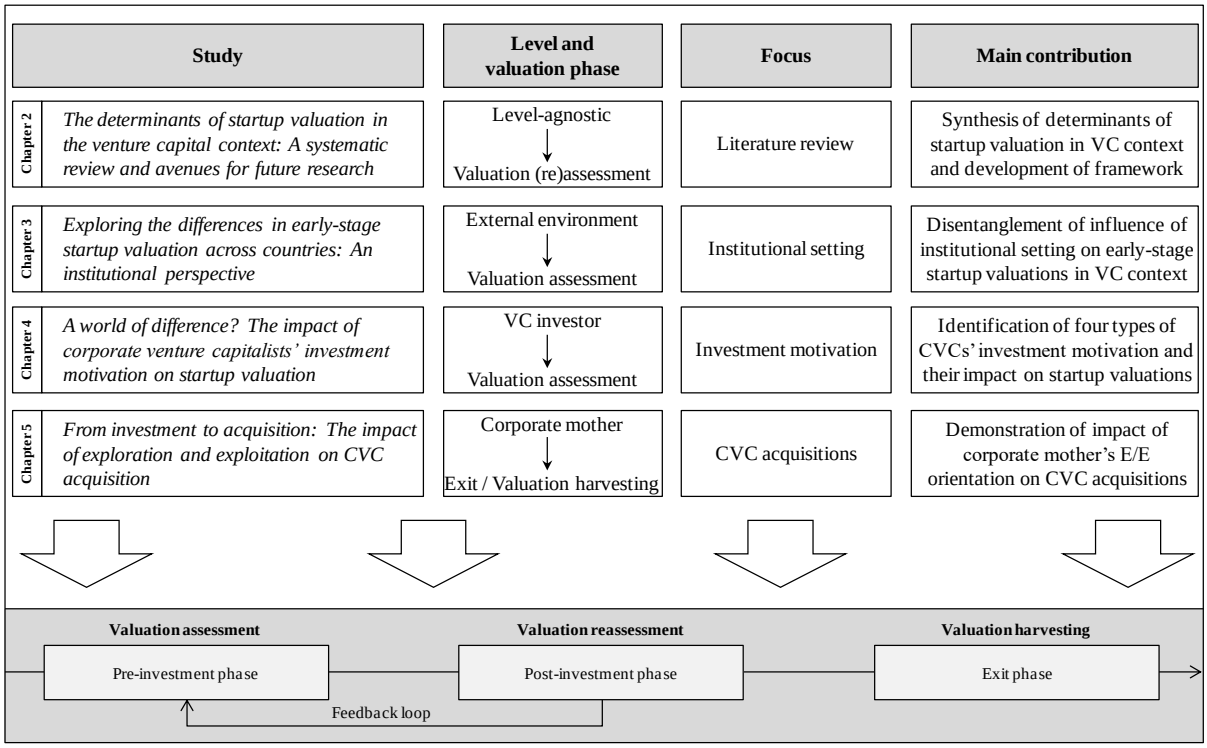
6.1 Summary of findings and contributions

From a broad and general perspective this dissertation examines startup valuation and entrepreneurial exit in terms of CVC acquisitions in the VC context, while each study adopts an individual perspective. To tackle the specific research questions, this dissertation relies on various analytical methods and a broad array of academic literature, thereby contributing to the under-researched topics of startup valuations (Cumming & Dai, 2011; Zheng et al., 2010) and startup acquisitions (Andersson & Xiao, 2016) in multiple ways (see Figure 10 for a summary of the dissertation's studies and their main contributions).

The systematic literature review—Köhn (2018)—presented in Chapter 2 provided an organizing structure to the literature on the determinants of startup valuation in the VC context by examining 58 empirical papers. It resulted in an integrative framework explicating that startup valuations in the VC context are determined by factors related to startups, VCs, and the external environment. The study accordingly contributes to the literature by answering the calls for further research on the underlying determinants of startup valuations (Cumming & Dai, 2011; Zheng et al., 2010), and is to the best of the author's knowledge the first systematic literature review on this topic. Interestingly, the literature review also showed that the de-

terminants of startup valuations in the VC context is a research topic that receives considerable attention in management-related journals. In light of the scope of this dissertation, the literature review had a particularly important role, in that, it revealed that the current empirical literature on startup valuations in the VC context focuses on the USA and that much of it applies regression analysis. In addition, the literature review revealed that further research regarding the role of CVCs in startup valuations is warranted. Consequently, in outlining these academic voids and needs for further research, the systematic literature review provided the foundation for the research designs and questions of Chapters 3 and 4.

Figure 10: Summary of dissertation's studies and their respective main contributions



Chapter 3 takes a configurational approach by applying fsQCA to explore the underlying institutional drivers alongside a nation's innovativeness of early-stage startup valuations across 13 countries. In total, the sample consists of 1,251 early-stage startup valuations covering the period 2009–2016. The study finds two configurations for the outcome of high early-stage startup valuations, and three configurations for the outcome of low early-stage startup valuations. The first configuration shows that independent of a country's national culture, a common law system in combination with high levels of innovativeness lead to high early-stage startup valuations. Hence, this configuration underscores the importance of favorable

formal institutions to enable startups to promote Schumpeterian economic growth (Burghof & Müller, 2016). The second configuration leads to an expectation that low uncertainty avoidance together with high collectivism might compensate for weaker formal institutions in terms of a civil law system. For the outcome of low startup valuations, two configurations, regardless of legal origin, exhibit low levels of national innovativeness in combination with unfavorable cultural conditions, represented by high uncertainty avoidance or low collectivism. The remaining configuration shows that a civil law system in combination with high levels of uncertainty avoidance and low levels of collectivism lead to low early-stage startup valuations. Consequently, the identified configurations highlight the advantages of employing a configurational approach to explore the institutional determinants of high and low early-stage startup valuation across countries.

Chapter 4—Röhm et al. (2018)—relied on CATA in combination with cluster analysis and HLM to identify the different types of CVCs' investment motivation and their impact on startup valuations. The study found four investment motivations among CVCs: strategic, financial, analytic, and unfocused. Consistent with the developed hypotheses, the study showed that from an intra-group perspective, CVCs with a strategic investment motivation assign lower valuations than their analytic counterparts, underscoring that entrepreneurs in line with the argumentation and findings of Hsu (2004) for IVCs may trade off strategically motivated CVCs' higher value-add potential against a valuation discount. In turn, CVCs with an unfocused investment motivation appear to be forced to assign higher startup valuations to compensate for their liability of vacillation, while CVCs with a financial investment motivation do not assign significantly different valuations than CVCs with an analytic investment motivation. Accordingly, this study contributes to the literature in multiple ways. In particular, it extends the black and white approach to CVCs' investment motivation (e.g., Dushnitsky & Lenox, 2006) by introducing CATA and cluster analysis as measures of a CVC's degree of strategic and financial investment motivation. Doing so makes it possible to identify the four different types of investment motivations noted above. Moreover, the findings add to the study of Heughebaert and Manigart (2012) by highlighting that CVCs should not be viewed as a homogeneous group; since just like other VC types, the heterogeneous investment motivations of CVCs impact startup valuations. Consequently, the study sheds light on the variability of startup valuations assigned by CVCs.

Chapter 5 shifted the focus to the exit phase of the VC investment and entrepreneurial process shown in Figure 10 by scrutinizing CVC acquisitions. To do so, the study relied on the framework of E/E to examine in what ways a corporate mother's explorative and exploitative orientation influences the likelihood of acquiring a startup funded through its CVC unit. The results illustrated that, in line with the developed hypotheses, corporate mothers with a greater degree of explorative orientation are more inclined to undertake a CVC acquisition, whereas the reverse effect was identified for corporate mothers with a more exploitative orientation. Beyond that, the results revealed a negative (positive) moderating role of the product market relatedness between corporate mother and startup on the effect of its explorative (exploitative) orientation on the likelihood of a CVC acquisition. In turn, the study can be considered an important contribution to the understanding of the entrepreneurial process with regard to the under-researched topics of startup acquisitions in general (Andersson & Xiao, 2016), and CVC acquisitions in particular (Benson & Ziedonis, 2010; Dimitrova, 2015). In addition to this, by focusing on the interplay of CVC investments and ultimate startup acquisitions, the study extends current research, which primarily studies the varying CV modes such as alliances, joint ventures or CVC investments in a comparative mode (e.g., Keil et al., 2008; Titus et al., 2017; Tong & Li, 2011), by consciously focusing on the inherent option of CVC investments as a means to identify potential acquisition targets (Benson & Ziedonis, 2010; Kaji & Peltz-Zatulove, 2015; Siegel et al., 1988).

To put the contributions of this dissertation as a whole to the research field of entrepreneurial finance into perspective, it is worth referring back to its introduction, which highlighted that Schumpeterian entrepreneurship is often linked to VC (e.g., Florida & Kenney, 1988; Kuckertz et al., 2015). Interestingly, Schumpeter (1934) differentiated between entrepreneurs, who identify and exploit entrepreneurial opportunities, and capitalists who provide capital. By explicating the operating principles and phases of the VC investment process, this dissertation therefore confirms that valuation and exit are integral parts of the entrepreneurial process. In sum, the dissertation provides three main contributions to the field of entrepreneurial finance. First, the acquisition of external capital to build the necessary financial resource base is often a crucial condition enabling entrepreneurs to exploit their innovative ideas, and in turn forms a central aspect of entrepreneurship (e.g., Pollack et al., 2012; Shane & Cable, 2002; Tyebjee & Bruno, 1984). Hence, by shedding light on the determinants of startup valuations in the VC context, this dissertation extends the understanding of the factors influencing the capital acquisition of entrepreneurs, since the valuation is necessary to deter-

mine the investment amount for a given equity share (Cumming & Dai, 2011; Hsu, 2004; Miloud et al, 2012). Second, current research seems to have largely overlooked the role of exits, and this dissertation concurs that "the entrepreneurial process is incomplete without the inclusion of entrepreneurial exit" (DeTienne, 2010, p. 203). Consequently, by viewing CVC as an option to acquire a startup (Benson & Ziedonis, 2010; Siegel et al., 1988), this dissertation provides new insights into the interplay of CVC investments and startup acquisitions. Third, research has shown that CVC plays an important role in nurturing innovation and since Schumpeter, innovation itself has been recognized as a vital driver of economic growth (Chemmanur et al., 2014). However, researchers seem to have widely omitted any exploration of the role of CVCs in the valuation and acquisition of startups. Therefore, by studying the influence of CVCs' investment motivation on startup valuation and CVC acquisition, this dissertation sheds important light on the role of the CVCs in the VC investment and entrepreneurial process.

6.2 Paths for future research

Each study contributing to this dissertation provides suggestions for future research in light of its specific research context. On top of this, when viewed in its entirety this dissertation illuminates further promising paths for future research.

The first study presented in this dissertation was the systematic literature review, which revealed that research related to the topic of startup valuation in the VC context relies significantly on commercial databases, above all VentureSource and Thomson One. These databases only state the final valuations assigned to a startup. Likewise, all three empirical studies included in this dissertation rely on data from these commercial databases. In particular, the studies of Chapter 3 and 4 examine startup valuations relying on the valuations stated in VentureSource. However, given that the purpose of these studies is to explore the effect of the institutional and cultural environment, and the impact of CVCs' investment motivation on the valuations ultimately assigned, doing so should not pose any issue. Nevertheless, the framework developed in the literature review highlights that startup valuations are the result of a negotiation process between entrepreneurs and VCs (e.g., Heughebaert & Manigart, 2012; Yang et al., 2009). Interestingly, however, the author has identified no article directly studying this process from an empirical perspective, despite the fact that its theoretical modeling has received considerable attention in the literature (e.g., Kirilenko, 2001). In view of this,

a particularly promising path for future research would be to build an anonymized startup valuation and acquisition database with the support of the international research, VC, and startup communities. That database might include blackened internal memos so that researchers can more comprehensively scrutinize the valuation and acquisition processes, the valuations and main clauses of the offers made, and that of the finally accepted one should be stated, as well as the opportunity for IVCs, CVCs and entrepreneurs to make them voluntarily available so that researchers can participate in the valuation and acquisition negotiations. In addition to this, the database should include entrepreneurs' reasons for accepting or not accepting financing and acquisitions offers. The advantages of such a comprehensive database are evident. Above all, researchers could gain deep insights into the valuation and acquisition process by scrutinizing how negotiations were conducted. Furthermore, researchers targeting an international scope can study the differences in the valuation and exit processes in light of various institutional and cultural settings (e.g., Heughebaert & Manigart, 2012). Clearly, constructing such an international valuation and acquisition database represents a massive undertaking, but doing so would doubtless trigger a quantum leap for the research on startup valuation and acquisition in the VC context.

In the introduction section of this dissertation, it was stated that the startup valuation of Uber of almost USD 70 billion is already higher than the market capitalizations of many incumbent industry players such as General Motors (Chen, 2015; The Economist, 2016). Indeed, some researchers argue that "young firms may be more valuable because relatively little is known about their long-run potential" (Eisdorfer & Giaccotto, 2014, p. 1015). Intriguingly, as revealed by the systematic literature review, startup valuation in the VC context is located at the intersection of the research fields of management and finance. In view of this, it is particularly interesting that in the recently published book titled "*Narrative and Numbers: The Value of Stories in Business*" Aswath Damodaran (2017)—finance professor and well-known expert in the field of valuation—links storytelling and financial reasoning to shed light, among others, on the valuation of Uber. In fact, the influence of storytelling, for example, on the ability to raise capital (Martens, Jennings, & Jennings, 2007), the legitimization of entrepreneurial failure (Kibler, Mandl, Kautonen, & Berger, 2017), and the setting of future expectations (Garud, Schildt, & Lant, 2014) is garnering an increasing amount of attention in the field of entrepreneurship. Accordingly, investor communication after receiving initial VC funding can play a vital role for startups (Kollmann & Kuckertz, 2006), particularly in light of the fact that startup valuations are reassessed over subsequent financing rounds, meaning that

they are dynamic and change over time (Broughman & Fried, 2012; De Clercq et al., 2006; Gompers, 1995; Tennert et al., 2017); in fact none of the dissertation's empirical studies relating to startup valuations specifically studied the determinants underlying the reassessment of startup valuations. In this regard, the work of Garud et al. (2014) in the context of storytelling is insightful because it highlights that the future expectations set through the projective story told by startup entrepreneurs to investors might not be met, which in turn can lead to disappointment on the investor side. In the realm of startup valuations, this is likely to result in down round valuations. A practical example adding perspective to that point is the down round tracker of CB Insights, which follows up on shrinking valuations by reporting which startups are not meeting expectations (CB Insights, 2017). As of July 2017, the down round tracker reported 130 down round valuations since 2015. Nevertheless, to the best of the author's knowledge, no academic research has yet studied the link between storytelling and startup valuation in the VC context. Therefore, future research on startup valuations in the VC context might find it productive to address the following research questions: (i) Are the startups run by better storytellers assigned higher valuations by VCs? (ii) what elements constitute a compelling entrepreneurial story in terms of startup valuation? (iii) when the expectations set through projective stories are not met, what are the storytelling elements that cause the valuation to be revised downward? and on the other side (iv) when expectations are exceeded, which storytelling elements are added to the entrepreneurial story that cause it to achieve higher valuations?

Finally, the last two studies presented in this dissertation specifically focus on the role of CVCs. That said, Chapter 4 investigates the impact of CVCs' investment motivation on the startup valuations they assign, while Chapter 5 examines CVC as a means to find promising acquisition targets. Albeit it is a reasonable course in the context of the underlying research questions, both studies examine factual outcomes, namely startup valuations and acquisitions, but do not explore how CVCs underpin their motivations in terms of specific investment terms. Consequently, to take the findings of these studies a step further, future research could scrutinize the investment terms set out by CVCs. For instance, strategically motivated CVCs might put special terms in their investment contracts with startups, such as the consent to granting them access to complementary assets from their mother companies (Dushnitsky & Lenox, 2005a; Park & Steensma, 2012) to underscore their strategic investment motivations. Further, corporate mothers that use CVC as a means to identify promising acquisition targets might at the time of the investment include in their investment agreements acquisition-related

investment terms such as the right of first refusal or the right of first offer for acquisition (Asel, Park, & Velamuri, 2015). Accordingly, future work scrutinizing the interplay of CVCs' investment motivations and the specific investment terms they use could substantiate the findings of this dissertation and moreover provide important practical insights. Research meeting this challenge could shed further light on the heterogeneity of CVCs by simultaneously studying their investment practices. In a related approach, future work could examine entrepreneurs' motivation to exit to the mother company of the CVC unit from which they received funding.

6.3 Final thoughts

This dissertation explores the underlying determinants of startup valuations and the factors driving CVC acquisitions, thereby addressing important and upcoming topics in entrepreneurship-related research (Kuckertz, 2013). Its findings further the understanding on the determinants underlying startup valuations and acquisitions in four ways. First, this dissertation develops an integrative framework for the underlying determinants of startup valuations in the VC context. Second, by taking a configurational approach, it provides new insights into how the institutional and cultural setting affects startup valuations. Third, it shows that the differing investment motivations of CVCs affect the startup valuations they assign. Fourth, it highlights that a corporate mother's explorative and exploitative orientation influences the likelihood that it acquires a portfolio startup of its CVC unit.

Certainly, despite its contributions, this dissertation only constitutes a small step toward a comprehensive understanding of the determinants affecting startup valuations and acquisitions in the VC context. In that sense, the empirical studies of this dissertation examined the phenomena of startup valuations and CVC acquisitions by focusing on individual and specific determinants. Indeed, to create a more thorough picture of the entrepreneurial process in terms of startup valuations and acquisitions, it is necessary to identify and study individual determinants. Accordingly, by providing novel insights on hitherto neglected factors, this dissertation enhances the current understanding of these topics. As a whole, this dissertation can therefore serve as a reference and starting point for scholars seeking to further illuminate these under-researched, but integral parts of the entrepreneurial process.

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