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Venture capitalists' decision-making in later-stage ventures

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Preface

Many people have accompanied me in my journey during the last 3.5 years as a PhD student and supported this work. I am grateful to all of them for their support and for the opportunity to work with and get to know them.

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René Andres

Trier, November 2018

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Abbreviations

ACA	Adaptive conjoint analysis
AuM	Assets under management
B2B	Business-to-business
B2C	Business-to-consumer
BA	Business angel
CBC	Choice-based-conjoint
CEO	Chief executive officer
CoC	Cash-on-cash
CVA	Conjoint value analysis
CVC	Corporate venture capital
EBIT	Earnings before interest and taxes
EBITDA	Earnings before interest, taxes, depreciation and amortization
Fig.	Figure
GDP	Gross domestic product
GEF	Growth equity fund
GP	General partner
HCA	Hybrid conjoint analysis
HNWI	High net worth individuals
IPO	Initial public offering
IRR	Internal rate of return
KNN	K-nearest neighbors
KPI	Key performance indicator
LP	Limited partner
MBA	Master of business administration
MBO	Management buyout

MFO	Multi family office
OECD	Organisation for economic co-operation and development
PE	Private equity
PSM	Propensity score matching
R&D	Research and development
RBC	Rating based conjoint analysis
RQ	Research question
S.D.	Standard deviation
SEC	Search, experience and credence
SFO	Single family office
SME	Small and medium size enterprise
Tab.	Table
TCA	Traditional conjoint analysis
VC	Venture capitalist
VCF	Venture capital fund
YoY	Year on year

1 Introduction

1.1 Motivation & relevance

External capital plays an important role in financing entrepreneurial ventures, mainly due to limited internal capital sources such as cash flow or private savings (Carpenter & Petersen, 2002; Coleman & Robb, 2012; Robb & Robinson, 2014). It can be a mean for these ventures to finance the early stages of their company (e.g., initial product development, hiring the first employees, or conducting R&D), as well as later stages (e.g., international expansion, product adaption, or additional marketing activities). There are several sources of external capital for young companies, which are a part of the field of entrepreneurial finance research (Denis, 2004; Cosh et al., 2009; Bellavitis et al., 2017). One of these external sources is capital from debt investors (e.g., banks or other credit institutions) or capital from equity investors (e.g., venture capital funds (VCFs) or business angels). As young companies are often not yet profitable, do not hold significant tangible assets as collateral, and have a higher risk of failure than do more established firms, financing through debt investors is difficult to obtain (Audretsch & Lehmann, 2002; Ueda, 2004; Vanacker & Manigart, 2010; De Rassenfosse & Fischer, 2016) or often requires personal guarantees or personal collateral (Colombo & Grilli, 2007). This is particularly the case when entrepreneurial firms rely on novel technology or require high initial investments. This is one reason why entrepreneurs regularly try to obtain external capital from private equity investors (e.g., VCFs, angel investors, or family offices) to cover their capital demand (Kortum & Lerner, 2000; Davila et al., 2003; Drover et al., 2017).

Venture capital investors / venture capitalists (VCs) such as VCFs or business angel invest equity into entrepreneurial ventures when they are young in order to profit from a future exit of the venture (e.g., IPO or trade sale).[1] By taking an equity stake of a company, they regularly become board members and obtain additional control and information rights (Cumming et al., 2010; Bengtsson, 2011). Well-known examples of entrepreneurial firms that received VC funding include Apple, Oracle, PayPal, Zalando, YouTube, Microsoft, Facebook, Airbnb, Dropbox, Google, and Cisco. As part of their operations, institutional VCs tend to follow the so-called “venture capital cycle”, in which they first need to raise money from outside individuals or institutions to be able to invest in companies, make investment decisions, manage

[1] This dissertation uses a broad definition of venture capitalists. I define venture capitalist as private or institutional investors that invest equity or equity-like instruments in entrepreneurial ventures.

their portfolio companies, and exit the investments (Gompers & Lerner, 2001; Gompers & Lerner, 2004). Investment decisions are particularly important, since they can be characterized by high uncertainty about the future success of the company and information asymmetry between the entrepreneurial firm and the VC (Bergemann & Hege, 1998; Carpenter & Petersen, 2002; Cumming & Dai, 2010). VCs worldwide are often confronted with thousands of proposals of entrepreneurial ventures per year and must choose among all of these companies in which to invest. On average, out of 100 proposals they receive, a VC invests in only 0.5-5% (Franke et al., 2004; Petty & Gruber, 2011; NVCA, 2014). Moreover, on deciding which company to invest in, the investment can be characterized as illiquid and success depends significantly on the management team of the venture. Because of these characteristics, the decision-making behavior of VCs is of particular interest to practitioners and academics. Questions such as "what decision criteria do VC use?" or "how do different combinations of decision criteria influence investors' decisions?" or "is the entrepreneurial team more important than the uniqueness of the product to investors?" are relevant to both practitioners and academics. New insights into this decision-making behavior of VC might result in better decisions by investors, more successful entrepreneurial ventures, a better match between both parties, and additional guidance for policymakers interested in nurturing external investors in an ecosystem.

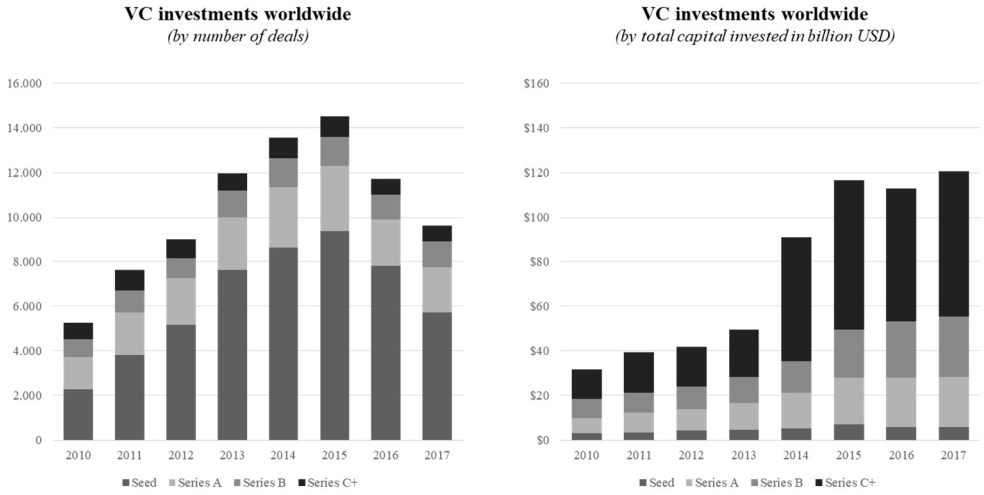
Not only do VCs finance companies at their early stages, when in many cases only a business idea exists, but they also finance entrepreneurial companies in their later stages, when companies have secured their first market success (Ruhnka & Young, 1987; Schmeisser, 2001). These investments in so-called growth ventures / scale-ups / later-stage ventures make up a substantial amount of all VC investments in small and medium-sized enterprises (SMEs) worldwide.[2] However, little is known about investors' decision-making in this context. As Figure 1 shows, approximately 24% of all deals and 77% of all capital invested in 2017 were invested in later-stage ventures.[3] It is surprising that scholars have so far neglected these types of ventures in their research on decision-making, despite its economic relevance. This is even more surprising, as studies have empirically shown that early-stage venture and later-stage ventures

[2] Market participants and academics frequently call these later-stage ventures "growth ventures" or "scale-ups" or "later-stage ventures", in contrast to early-stage ventures that they frequently refer to as "start-ups" (Willms, 1985; Bottazzi & Da Rin, 2002; Prencipe, 2017; Aernoudt, 2017; Duruflé et al., 2017). An illustration of its importance can be identified in recent policy initiatives. Next to initiatives supporting start-ups, European policymakers also started to implement initiatives supporting "scale-ups" in order to increase EU innovation and competitiveness, thus strengthening the economy (EC, 2016).

[3] In this case, the dissertation refers to Series B & Series C+ investments as later-stage investments using the terminology and definition of second stage financing (Ruhnka & Young, 1987; Fried & Hisrich, 1994; Schmeisser, 2001). In this figure, SMEs are ventures with less than 250 employees. Another study by the Startup Europe Partnership estimates the number of European scale-ups as 4,200, equal to 0.33% of Europe's GDP (SEP, 2017).

have different risks, goals and characteristics and provide investors with different level of information (Rhunka & Young, 1987; Carter & Van Auken, 1994; Gompers et al., 2016a). These different information of a later-stage venture are likely to be treated differently by investors compared to an early-stage venture (Connelly et al., 2011).

Fig. 1: VC investments in SMEs worldwide



Source: Pitchbook Inc.

Past research focuses mainly on investigating the decision-making behavior of VCs regarding early-stage ventures rather than later-stage ventures (see overviews in Silva, 2004; Nunes et al., 2014; Sharma, 2015). Therefore, little is known about the decision-making behavior of VCs investing in later-stage ventures. However, as later-stage ventures have a significant relevance for developed economies and are associated with employment growth and innovation, this is an important research gap that this thesis addresses (Friar & Meyer, 2003; Gilbert et al., 2006; Van Praag & Versloot, 2007; Shane, 2009; Block et al., 2017).[4]

The importance of later-stage ventures is also visible in investors' characteristics. Investors specialize in different company development stages and create dedicated investment firms purely focusing on later-stage ventures, as a quote from David Lawee, a partner of Google Capital, shows:

> *"Ever since our founders began working out of a garage in Menlo Park, we've thought about what it takes for entrepreneurs to build the companies they dream of. Sometimes this means bringing great startups to Google—but other times, it means*

[4] This is in line with current research that highlights that later-stage venture capital has a significantly higher impact on innovation compared to early-stage venture capital (Faria & Barbosa, 2014).

> *we go to them. Today, we're launching Google Capital, a new growth equity fund backed by Google […].*
>
> ***Like our colleagues at Google Ventures, our goal is to invest in the most promising companies of tomorrow, with one important difference. While Google Ventures focuses mainly on early-stage investments, we'll be looking to invest in companies solely as they hit their growth phase**. That means finding companies that have already built a solid foundation and are really ready to expand their business in big ways. We'll look across a range of industries for companies with new technologies and proven track records in their fields."*
>
> *[David Lawee (2014); text is not highlighted in the original quote]*

Not only do dedicated investment firms that invest in only this type of company exist, but a more diversified base of investors also invest in entrepreneurial ventures in their growth stage. These investors include corporate venture capital funds (CVCs), VCFs that have the capacity to make later-stage investments, family offices (FO), growth equity funds (GEFs), or buyout funds. All of these investment firms differ in various characteristics such as resources, goals, governance, or experience, and it is therefore important to evaluate the decision criteria they use when assessing later-ventures and how their institutional structures shape these criteria. This dissertation tries to shed light on the decision-making behavior of VC investors when assessing later-stage ventures. Two quotes from Dean Shepherd from 1999 and from Gompers et al. (2016a) reflect this research gap and the importance of this thesis:

> *"Do VCs weight criteria differently in their assessments of businesses in different stages of development? For example, where uncertainties over the future environmental conditions and the appropriateness of specific strategies are reduced (e.g., mezzanine financing or leveraged buyouts), do VCs rely less on the quality of the management team in their assessment of a firm's probability of survival? **Do VCs use different criteria for their assessments of businesses in later stages of development?** […] Much important research remains to be done."*
>
> *[Shepherd 1999b, p.630; text is not highlighted in the original quote]*
>
> *"Given that **stage of development should play a large role in the decision-making process of VC firms**, our subsequent analysis breaks out these two subsamples and compares their survey responses. […] The team is more likely to be the most important factor for early-stage investors and IT investors than for late-stage and healthcare investors. Business related factors are more likely to be most important for late-stage and healthcare investors."*
>
> *[Gompers et al., 2016a, p.12 & p.18; text is not highlighted in the original quote]*

The overall research question of this dissertation is: How can the decision-making behavior of VCs that invest in later-stage ventures be described?

1.2 Research questions

First and foremost, this thesis aims to shed light on the decision-making behavior of VCs when evaluating later-stage ventures. As outlined above, this goal has both theoretical and practical relevance. For market participants (investors and later-stage ventures) insights into decision-making might allow better matchmaking between companies and the most suitable investor. VCs can also profit from such insights, due to the identification of potential bias in their decision-making that might exist. This dissertation also aims to contribute to the theoretical literature, by assessing signals that VCs use to come to a decision and how that decision is influenced by governance structures (principal-agent relationships) or cognitive processes. As a contribution to the literature, this thesis investigates several research questions about the decision-making behavior of VCs in the case of later-stage ventures. Previous studies show that VCs use various decision criteria such as market characteristics (e.g., market size), product characteristics (e.g., uniqueness), aspects of the management team (e.g., industry experience), or financial factors (e.g., ease of liquidation) when making a decision on an investment opportunity (see overview of studies in this research field in Silva, 2004, Nunes el al., 2014 or Sharma, 2015). While many studies have been published in this field, they mainly focus on the case of early-stage companies; suffer from various methodological, theoretical, and data limitations; and do not focus on later-stage ventures. This thesis uses qualitative and experimental quantitative exploratory research methods to contribute to the entrepreneurial finance and entrepreneurship literature to address this research gap. In this vein, this thesis addresses five specific questions.

As stated above, prior research already investigated the decision behavior of investors for early-stage companies. The research in this domain is split into 2 subdomains: decision-making criteria research and decision-making process research (Silvia, 2004). The first focuses on the criteria investors use and the second focuses on the actions VCs perform to come to a decision. This thesis falls within the first research stream of decision-making criteria research. When VCs receive information on an investment opportunity in the form of business plans or teasers, they need to interpret various information signals to make a decision (Connelly et al., 2011). As VCs might confront different information for a later-stage venture than for an early-stage venture due to the age and development of the firm, it constitutes a unique decision scenario that I examine in this thesis. Examples of potential new or additional decision criteria that VCs use include the presence of existing institutional investors in the later-stage venture, its established business model characteristics, financial performance data, or the ability to scale

the business internationally, which do not exist or are insufficient for early-stage ventures. Moreover, the decision-making of VCs is a multi-stage process, which consist of multiple events and actions such as face-to-face meetings, document reviews or external consultation (Petty & Gruber, 2011). The initial review of a business opportunity, often referred to as "screening", is a process step in which an investment professional reviews the business plan or teaser sent by the company the first time. Interestingly, around 80% of initial investment opportunities are rejected by VCs during this screening, significantly reducing the number of investment opportunities (Franke et al., 2004). Therefore, the first research question is about identifying these decision criteria in the context of later-stage ventures and gaining a better understanding of the screening decision. Due to the novel nature of the question, this constitutes an explorative research question that this dissertation tries to answer with qualitative approach. Hence, this thesis addresses the following first research question:

RQ 1: *Which decision criteria do VCs use when screening later-stage ventures?*

While it is relevant to identify, describe, and characterize the decision criteria that VCs use for these types of companies, it is even more important to understand the importance of each criteria and its interactions. In this vein, past research shows that VCs simultaneously use various criteria in their decision process rather than relying on isolated criteria (Bachher & Guild, 1996; Shepherd et al., 2000; Sharma, 2015). Moreover, past studies investigate the relative importance of investors' decision criteria and reveal that some criteria are more relevant than others, and therefore represent a more important criteria to investors (see overview in Nunes et al., 2014). However, there is an ongoing debate as to which criteria are the most important to investors. In the context of early-stage ventures, some studies conclude that the entrepreneurial team is the most relevant, whereas others argue that the uniqueness of the product is the key (Zacharakis &Meyer, 1998; Franke et al, 2008; Nunes et al., 2014).[5] To understand the importance of the decision criteria and its interaction and to provide valuable information to investors, entrepreneurs, and scholars, this thesis addresses the following research questions:

RQ 2.1: *What is the relative importance of the decision criteria that VCs use when screening later-stage ventures?*

[5] The following quote from MacMillan et al. (1985), in which they argue that the most important criteria relate to the entrepreneur's characteristics, illustrate this debate: *"There is no question that irrespective of the horse (product), horse race (market), or odds (financial criteria), it is the jockey (entrepreneur) who fundamentally determines whether the venture capitalist will place a bet at all." (MacMillan et al., 1985, p.119).*

In reality, a VC is confronted with multiple information on a later-stage venture to assess at the same time. Research has shown that VCs invest in companies even though they do not show the most preferred characteristics (Tyebjee & Bruno, 1981). For example, the market of a venture might be highly competitive and the uniqueness of the product might be deemed low, however if the management team is of high quality, VCs might still be willing to invest. On the other hand, the combination of two criteria (e.g., a high quality team and a unique product) might be seen more valuable together than the isolated criteria. Hence, this thesis addresses the following research question:

RQ 2.2: *Do combinations of various decision criteria send a stronger signal to VCs than individual decision criteria do?*

Past research shows that information from companies can be interpreted differently depending on the institution or the individual assessing the information. Studies show that human capital and cognitive characteristics such as experience, knowledge, and skills can influence the investor's decision-making behavior (Franke et al., 2006; Gompers et al., 2006; Franke et al., 2008; Cumming & Dai, 2010). This is regularly attributed to so-called cognitive schemata (individual structures consisting of skills, learned concepts, and knowledge (Gagné & Glaser, 1987)) that people can develop over time and that can influence their decision-making behavior. In this vein, many investors might develop specific schemata through being entrepreneurs themselves before joining an investment firm or through long experience as an investor. This is an important relationship to investigate, as it can provide investors with insight into sources of different decision behavior within their teams. To evaluate the individual characteristics of decision-makers and the interaction with the decision criteria used, the thesis addresses the following research questions:

RQ 3.1: *To what extent does an investor's experience influence decision-making behavior when screening later-stage ventures?*

In practice, former entrepreneurs regularly become investors themselves. Examples include Oliver Samwer (founder of several companies including Alando or Zalando, later investors at Global Founders Capital), Niklas Zennström (founder of Skype, later investor at Atomico) or Xavier Niel (founder of Iliad, later investors at Kima Ventures). Research has shown that entrepreneurial experience can effect individual behavior and knowledge through the learnings made during the time of being an entrepreneur (e.g., Ucbasaran et al., 2003a; Ucbasaran et al., 2003b; Ucbasaran et al., 2010; Farmer et al., 2011). This experience might include aspect such as the ability to innovate, utilizing new technology, being passionate, being

able to change, learn from failure or the ability to grow a small team to a large enterprise. This might lead a different decision behavior of former entrepreneurs that have become VCs compared to VCs without former entrepreneurial experience. Hence, this thesis addresses also the following question:

> ***RQ 3.2:*** *How does an entrepreneurial background influence the decision-making behavior of VCs when screening later-stage ventures?*

Decision-making behavior can also be viewed from an institutional perspective. Past research shows that investors differ in how they assign importance to specific decision-making criteria (Bachher & Guild, 1996; Hsu et al., 2014). Some put more focus on financial characteristics and others on team characteristics. Potential explanations include different investment horizons (short-term vs. long-term), diverse investment styles (active vs. passive), dissimilar investment goals (pure financial goals vs. strategic, non-financial, or innovation goals), or different resource endowments (large investor network vs. small investor network) (Kraaijenbrink et al., 2010). Regarding later-stage ventures, the most active VC investors include VCFs, CVCs, family offices (FO), growth equity funds and buyout funds (Drover et al., 2017; PwC, 2017). Interestingly, the named investors differ in their governance, incentive mechanisms, goals and resource endowment (Elango et al., 1995). Therefore, it can be expected this to have an effect on the decision behavior. These investors can be grouped into three very different types in terms of these aspects: 1) FOs, 2) CVCs, and 3) growth equity, buyout, and VCFs. Regarding CVCs, the literature shows that CVCs are often an important part of the innovation strategy of their corporate mother company; thus, CVCs identify young companies that fit their strategy and invest in them (Dushnitsky & Lenox, 2005). This may result in different levels of importance associated with decision criteria, compared to VCs that are orientated towards financial goals (Manigart et al. 2002). In addition, FOs, due to their mix of financial and non-financial goals, long-term orientation, and risk aversion may also attribute different importance to decision criteria than other investors do (Ford & Nelsen, 2014; Wessel, 2013; Wessel et al., 2014). To assess the influence of the investor type on the decision-making behavior, this dissertation addresses the following questions:

> ***RQ 4.1:*** *How do FOs differ in their decision-making behavior than other investors when screening later-stage ventures?*

> ***RQ 4.2:*** *How do CVCs differ in their decision-making behavior than other investors when screening later-stage ventures?*

Answer to these questions can contribute to the entrepreneurial finance literature by providing insights if different governance structures and goals of VCs are translating into different decision behavior of the investment professionals or if incentive- and control mechanisms are not effective.

Lastly, the investment decision is one important part of the overall venture capital cycle. Therefore it is also relevant to investigate the association between decision-making behavior and the financial performance of VCs. This is highly relevant for investors and limited partners of such investment firms because it provides insights on the factors that influence financial performance. Investors must be exceptionally good at selecting the right companies to invest in, also known as the "selection effect" in the entrepreneurial finance literature (Amit et al., 1998; Bertoni et al., 2011).[6] In addition, the literature argues that investors also need to be good at supporting the ventures in which they invest, known as the "treatment effect" in this stream of literature (Bertoni et al., 2011). Which of these effects actually is present and how large these effects are, is still part of the scientific discussion. Providing insights into these questions is a complex task for researchers, as VCs invest in ventures for many years (often up to 10 years) and therefore makes it difficult to disentangle factors that might influence a financially positive outcome (e.g., IPO or trade-sale) or a financially negative outcome (e.g., bankruptcy). Because of the importance of financial performance to investors, the following explorative research question is addressed:

> ***RQ 5:*** *What is the association between decision-making behavior and the financial performance of VCs that invest in later-stage ventures?*

Explorative insights regarding this research question, can provide initial hints for investors and its limited partners by identifying factors that influence the financial performance. This can for example have an effect on the team composition (e.g., hiring investment professionals that are exceptionally good in supporting companies vs. professionals that have been known to select promising companies early) or on governance structures (stricter control on selection of companies vs. more control on the monitoring of existing investments). This question is important for VCs, due to the fact that not meeting financial expectations can threaten further fundraising from capital providers, such as limited partners, and therefore threaten the existence of the VC.

[6] This thesis uses not the definition of "selection effect" and "treatment effect" common to the econometric and statistic literature here, but rather to the VC literature (Bertoni et al., 2011).

1.3 Dissertation structure

This dissertation is structured into six chapters. **Chapter 2** reviews the literature on VCs decision-making and carves out the specific characteristics of later-stage ventures compared to early-stage ventures. In addition, I review the two main research streams in the decision-making of VCs (criteria and process research) and its findings in the context of the stated research questions. This contributes to the first research question (RQ1), by identifying potential decision criteria already mentioned in past studies. I further identify the research gap and build a theoretical framework in order to evaluate decision-making policies in the context of this dissertation. In addition, I present the limitations of existing studies and discuss the implications for this thesis.

Chapter 3 describes the 19 qualitative interviews with VCs to gain the first insights into decision-making behavior, specifically for later-stage ventures. To answer the first research question (RQ1), I present the results from these interviews and their implications. The chapter distills the most relevant decision criteria that VCs use. It also reveals VCs evaluate later-stage ventures differently compared to early-stage ventures and the structure of their decision process for later-stage ventures.

Chapter 3 focuses on identifying the relevant decision criteria and serves as a basis for the next chapter (**Chapter 4**), which is methodological chapter that describes the main method employed in the remaining part of the dissertation. **Chapter 4** discusses the "in-use" measurement method for VCs' decision behavior with a quantitative experimental conjoint analysis to evaluate the trade-offs and relative importance of specific decision criteria when screening later-stage ventures.[7] Past research shows that survey or interview-based approaches can have significant bias and conjoint experiments offer better real-time insights into VCs' decision behavior (Zacharakis & Meyer, 1998; Shepherd & Zacharakis, 1999; Shepherd, 1999a; Sharma, 2015). Therefore, Chapter 4 describes the methodological approach to the choice-based-conjoint (CBC) analysis I use in this dissertation and its adequacy to measure individuals' decision-making behavior in the context of research questions RQ2-5. In addition, Chapter 4 describes the implementation of the conjoint experiment and the sample of VCs chosen for the quantitative analysis. Chapter 4 is then used in conjunction with the results from chapter 3 in order to answer the remaining research question in the following chapters.

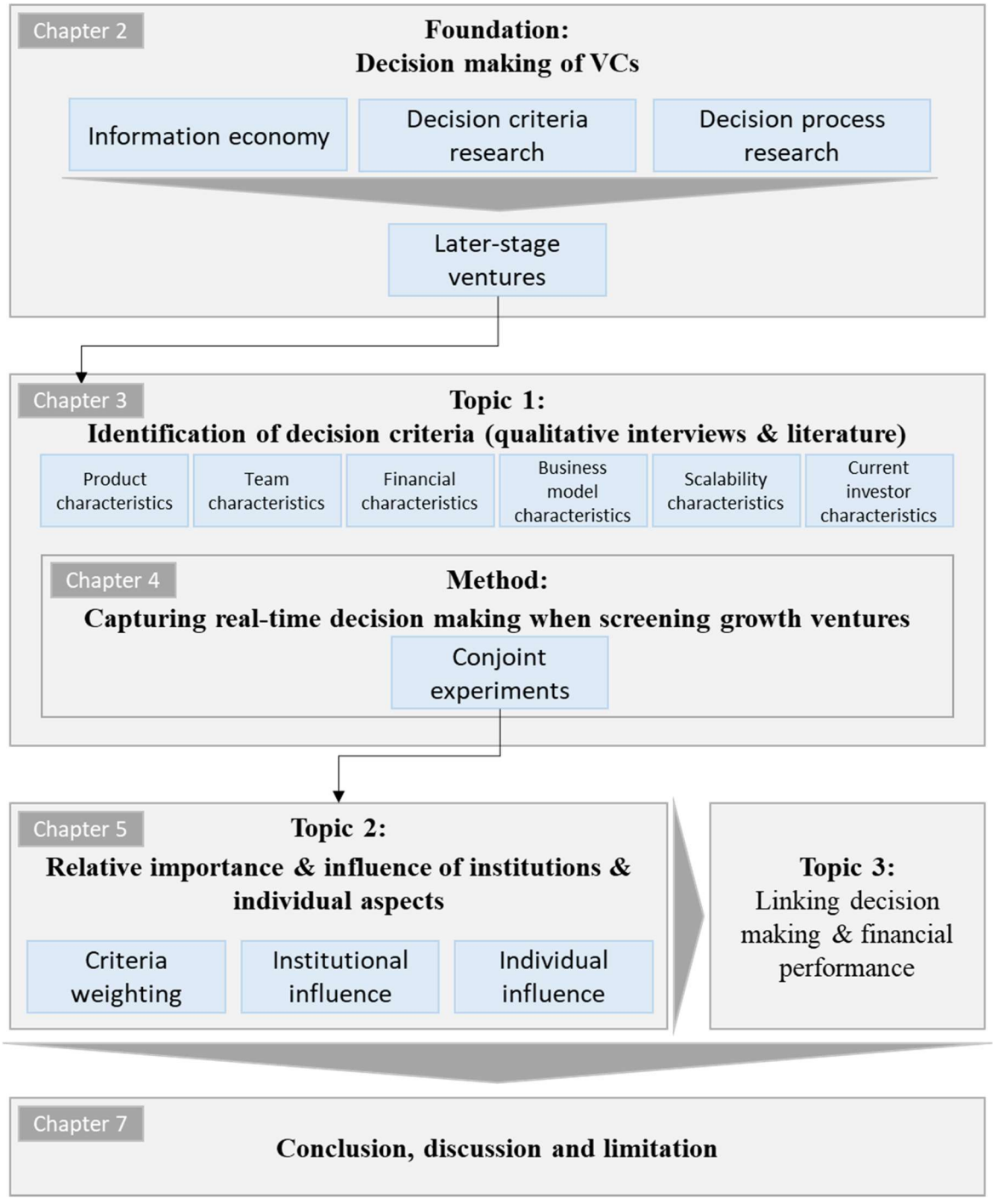
[7] The term "in-use" refers to an initial study by Zacharakis & Meyer (1998) and describes the real-time measurement techniques of decision-making compared to "espoused theories" measured via post-hoc techniques.

As Chapter 4 deals with the setup of the conjoint method and explains its adequacy to address the research questions, **Chapter 5** evaluates data resulting from the conjoint experiment with 749 VCs and is used to empirically answer the remaining research questions. It starts with initial statistical tests on the gathered data to identify potential issues such as non-response biases, click-through behavior, or validity issues, and provides the initial descriptive statistics on the data and sample. To evaluate the importance that VCs associate with different criteria and potential trade-offs, I use various quantitative regression methods. I next extend the initial analysis by analyzing the hypothesized relationships on the interaction between individual (cognitive schemata – experience and entrepreneurial background: RQ3.1 and RQ3.2) and investor characteristics (CVCs and FOs: RQ4.1 and RQ4.2) on the decision behavior. I present and discuss the results.

Following this, **Chapter 6** assess the association between the decision behavior and individual financial performance in the last analysis. This explorative analysis tries to shed light into the last research question (RQ5) and provide hints to disentangle factors that might influence financial performance of VCs in the context of later-stage ventures.

Chapter 7 concludes with a summary of the key results and contributions of this thesis to the entrepreneurial finance literature. I discuss the relevant implications for theory and practice. Based on the results, I derive recommendations for VCs, entrepreneurs, and policymakers. The dissertation concludes with an outlook on future research avenues and describes the limitations of this study. Figure 2 provides an overview of the chapters of this thesis.

Fig. 2: Dissertation structure



Source: Own illustration.

2 Literature review and definition of later-stage ventures

In this chapter, I review the past research on VCs' decision-making in entrepreneurial ventures to identify initial screening criteria for later-stage ventures, outline the relevant theories to explain decision-making, explain the theoretical framework to assess decision-making within this dissertation, establish a definition of later-stage ventures, and carve out the research gap more precisely.

2.1 Later-stage venture definition and theory on decision-making

This subsection defines the core research subject of this thesis, later-stage ventures, outlines existing theories to describe VCs' decision-making, and develops a theoretical framework to assess decision-making behavior in the context of this dissertation.

2.1.1 Definition of later-stage ventures

VCs invest in different stages of development of an entrepreneurial venture (Robinson, 1987; Ruhnka & Young, 1987; Ruhnka & Young, 1991; Carter & Van Auken, 1994; Invest Europe, 2007; Gompers et al., 2016a). This can be just business ideas in some cases and mature start-ups in other cases. This is often referred to as the "stages-of-development paradigm." This concept is taken from the lifecycle literature and tries to describe the phase in the lifecycle of an entrepreneurial firm that investors invest in (Galbraith; 1982; Lewis & Churchill, 1983; Scott & Bruce, 1987). With words like "seed," "series A," "series B," "expansion stage," "early stage," "pre-seed," "early growth stage," "startup stage," "late stage," and various others terms, investors try to indicate the lifecycle stage and type of venture they invest in (Invest Europe, 2007). However, there is no universal definition for most terms, and hence they are used heterogeneously in both theory and practice.

To establish a definition of later-stage ventures for the context of this dissertation, I use insights from past research. One of the first studies to shed light on the definition of the various terms used to describe entrepreneurial ventures in practice is by Ruhnka & Young (1987). In their study of 73 US-based venture capital firms, they ask partners and executives in these investment firms what they identify as relevant characteristics of the process of developing new businesses. They were also asked if they differentiate between stages in the development process. For each of the identified stages, participants were asked to distinguish characteristics, describe the goals of the venture, and name the major risk for the venture at that stage. They

find consensus with the "stages of development paradigm" and identify five distinctive stages that venture capital investors invest in: 1) "seed," 2) "start-up," 3) "second stage," 4) "third stage," and 5) "exit stage." The authors showed that, for example, in the "seed stage," the characteristics of the venture include having only an idea, with no prototype or business plan. The major goals in this early stage are to produce a working prototype and to do a market assessment. Additionally, the major risks are that a workable prototype cannot be produced or that the venture is running out of funds. Compared to this, in the later stages of development, participants expressed a different view of the characteristics, goals, and risks. The characteristics of later-stage ventures include having initial orders and a full management team in place. In terms of goals, participants named achieving market penetration, reaching break-even, and increase production capabilities as the main goals. The major risks are having the wrong marketing strategy or a poor management team. A few studies follow Ruhnka & Young (1987) – e.g., Carter & Van Auken (1994) and Elango et al. (1995) – and further shed light on the definitions and provide similar results to Ruhnka & Young (1987). Moreover, Bygrave & Timmons (1992) argue that the differences between early- and late-stage ventures are so significant that investors focusing on late-stage companies should be considered differently. Additionally, Carter & Van Auken (1994) argue that due to the different risk and return profiles, investors will treat early- and late-stage ventures differently. Also industry standards have emerged to describe the stage of a venture. The European Venture Capital Association (EVCA – today called Invest Europe) categorizes here three different stages: 1) Seed-stage – VCs can provide funding and support to entrepreneurs at a very early stage of the business to get an idea off the ground or to develop a business plan; 2) Early-stage – Once a business is ready to launch, VCs can offer early-stage capital and expertise to take the product or service to market and build momentum; 3) Later-stage or expansion-stage: VCs also invest in companies that have started to generate revenues but need further capital to expand and reach profitability (Invest Europe, 2016).

Definition

***Later-stage ventures**: Entrepreneurial firms[8] that have started to generate revenues with a novel product or service that is sold to multiple customers, show growing revenues and are striving for further growth.*

[8] This thesis uses the term entrepreneurial firm to differentiate against SMEs. Entrepreneurial firms are companies that exist in order to generate economic returns associated with an unexploited market opportunity (Alvarez & Barney, 2004; Langlois, 2007).

2.1.2 Early-stage ventures vs. later-stage ventures

I differentiate this definition of later-stage ventures from early-stage ventures by market / product dimensions, management / organizational dimensions, and financial dimensions. The first differentiator of later-stage ventures and early-stage ventures is in the stage of a product's market readiness. While later-stage ventures already have a developed product/service that they are selling to multiple customers, early-stage ventures often only possess or are developing a prototype of their product (Ruhnka & Young, 1987; Jawahar & McLaughlin, 2001; Bottazzi & Da Rin, 2002; Repullo & Suarez, 2004, Invest Europe, 2016). This leads to the second differentiator of market acceptance, which is the willingness of customers to use the product / service. While later-stage ventures already have multiple customers and demonstrate a market demand for their product / service (Invest Europe, 2016), early-stage ventures usually have no customers or only test- / pilot customers (Swamidass, 2013). Early-stage ventures are often in a stage in which they are experimenting with how to structure their business, including their value proposition, market segments, value chain, estimated cost structure, and profit potential. This structure can be called the business model (Chesbrough & Rosenbloom, 2002; Moogk, 2012; Trimi & Berbegal-Mirabent, 2012; Bosch et al., 2013). While early-stage ventures still need to test and develop these areas, later-stage ventures have already validated their business model by attracting multiple customers (Ruhnka & Young, 1987, Invest Europe, 2016). Financial characteristics can also be used to define later-stage ventures and differentiate them. Some market participants define later-stage ventures as entrepreneurial ventures that have a least 1 million EUR revenue p.a. (SEP, 2017). Next to the level of revenue, growth is a characteristic of later-stage ventures. The OECD defines later-stage ventures as having at least an average of 20% p.a. revenue growth over a period of three years (Eurostat-OECD, 2007; Hölzl, 2013). [9] [10]

Early-stage ventures or start-ups are described as being between 0 and 2 years of age, whereas later-stage ventures are more mature and often described as being between 2 and 5 years of age (Ruhnka & Young, 1987). Additionally, later-stage ventures have larger organizational sizes than do early-stage ventures (Mueller et al., 2012). While later-stage ventures have often at least 10 employees and a complete management team, early-stage ventures often only consist of the founders and / or an incomplete management team (Ruhnka & Young, 1987;

[9] Eurostat-OECD defines growth ventures / later-stage ventures (also referred to as scale-ups) as companies with an average annual growth of at least 20% (revenue or employees) in the past 3 years with at least 10 employees in the beginning of this period. (Eurostat-OECD, 2007).

[10] Some studies even use a 50% annual revenue growth rate over three years to define high-growth ventures (e.g., Autio et al., 2000; Halabisky et al., 2006).

McCarthy et al., 1991; Lichtenstein et al., 2006; Petersen & Ahmad, 2007; Eurostat-OECD, 2007). Table 1 provides an overview of the differences between later-stage and early-stage ventures based on the discussion above.

Tab. 1: Contrasting later-stage ventures vs. early-stage ventures

Characteristics	***Later-stage ventures***	***Early-stage ventures***[11]
Stage of product / service	Developed product / service	Prototype / Beta testing / Proof-of-concept
Market acceptance	Multiple paying customers	None or pilot customers
Business model	Validated by market	Under development / testing
Financial growth	At least 20% revenue growth p.a.	< 20% revenue growth p.a.
Revenue	> 1 million EUR in revenues p.a.	None or little revenues (< 1 million EUR p.a.)
Age	2-5 years	0-2 years
Organizational size	Founder and multiple employees (often > 10)	Founder and / or incomplete management team

Source: Own illustration based on Ruhnka & Young (1987), Ruhnka & Young (1991), Carter & Van Auken (1994), Elango et al. (1995), Mueller et al. (2012), Hölzl (2013), and Invest Europe (2016).

In addition to these characteristics, past research emphasizes the different goals and risk associated with later-stage ventures. While the risk in seed and early-stage ventures is mainly associated with the management team, initial market acceptance, and technology, these risks are not as relevant for later-stage ventures because they already show market acceptance (Mueller et al., 2012). However, one of the key goals for later-stage ventures is growth in sales, reaching profitability, and entering new international markets. This is often not a key goal for early-stage ventures, as market acceptance might not be fully validated (Invest Europe, 2016).

This way of defining and contrasting later-stage ventures against early-stage ventures is not without limitations: some characteristics overlap with other types of ventures, not all characteristics need to be satisfied, and some characteristics remain vague. Such a broad definition might not be suitable in all circumstances, but it captures the most frequent characteristics of later-stage ventures expressed by market participants and in the literature. Nevertheless, various aspects clearly distinguish later-stage ventures from other ventures. The literature supports the differentiation between the stages of development (Carter & Van Auken, 1994; Invest Europe, 2007; Gompers et al., 2016a) and therefore provides a first indication that VCs' decision-making behavior might differ depending on the development stage of the venture.

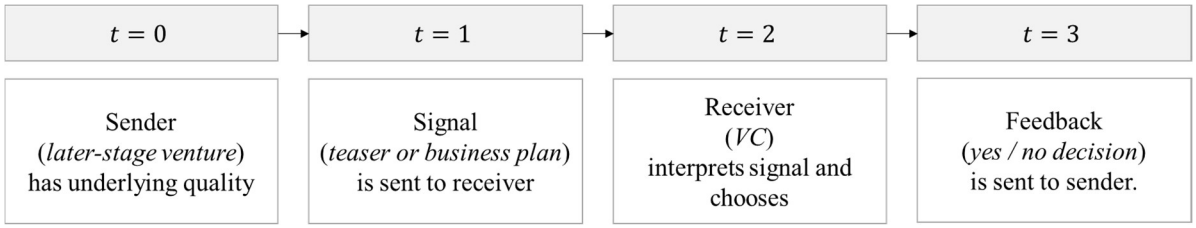
[11] Often called the "start-up-stage".

2.1.3 Information economy theories and VCs' decisions

VCs (e.g., VCFs or growth equity funds) tend to follow the "venture capital cycle," in which they raise money from other individuals or institutions, make investment decisions about ventures, manage the portfolio, and exit the investments (Gompers & Lerner, 2001; Gompers & Lerner, 2004). The investment decisions are particularly relevant. An important aspect of these decisions is that they can be described as being highly uncertain in terms of the future success of the venture (Bergemann & Hege, 1998). This translates into the fact that many investments result in a total loss of the investment and only a few return large profits. In practice, investors often refer to the "80/20 rule" (Top Tier Capital Partners, 2017), a heuristic rule which states that 80% of the fund' return is from 20% of the portfolio companies (Zider, 1998; Mainprize et al., 2003). This is in line with other studies indicating that more than 75% of all venture capital investments fail (McDermott, 2012; Blodget, 2013; Wagner, 2013). Practice and research confirms that investors are confronted with the challenge of deciding in which of many hundreds or sometimes thousands of entrepreneurial ventures to invest.

A relevant first theoretical construct that helps to identify what information investors consider, consume, and interpret when making an investment decision is signaling theory (Connelly et al., 2011). Signaling theory is an information economy theory in which two parties have access to different information. These two parties are the sender (the party that sends an information signal) and receiver (the party that receives and interprets the information signal). Indeed, signaling theory (Spence, 1978) is the dominant approach to study investment decisions in a broad field of studies, from finance to management (Connelly et al., 2011). The sender (in this dissertation, a later-stage venture) communicates information to the receiver (in this dissertation, a VC) that the receiver needs to interpret. Interpretation is the process of translating signals into perceived meaning for the receiver (Connelly et al., 2011). Figure 3 outlines the multiple steps of information signaling.

Fig. 3: Signaling process in VC investments



Source: Based on Connelly et al., 2011.

However, for signaling to take place, signaling theory assumes that the sender should benefit from an action by the receiver, which the receiver would not have otherwise done (Connelly et al., 2011). That is, the signal needs to have a "strategic effect" which has been studied in various management and entrepreneurship fields (e.g., Certo et al., 2001; Elliot et al., 2009). In the context of this thesis, this strategic effect exists because as a later-stage venture would benefit through financing and value-added support from the VC in case of a positive decision, which it would otherwise not receive. In addition, a later-stage venture (represented by the firm's management) has different information on the quality of the venture than the potential investor does.

Tab. 2: Signaling theory assumptions

Signaling theory assumption	Context of this dissertation
(1) Information asymmetry between sender and receiver	Later-stage ventures possess more information than VCs do.
(2) Presence of "strategic effect"	Later-stage ventures can profit from a positive decision of the VC, based on the transmitted information.
(3) Signal observability	Later-stage deliberately communicate information to VCs via business plans or teasers.
(4) Signals need to be costly in order to be efficacious signals	By sending costly signals, high-quality later-stage companies can differentiate themselves against low-quality later-stage companies.

Source: Based on Connelly et al., 2011.

Unique for these types of investments is how the signal is communicated to the receiver. It is very consistent across different ventures. In most cases, this is done via a business plan or teaser, which very frequently consists of the same elements. In the context of signaling theory,

this fulfills the assumption of "signal observability," which refers to the extent to which outsiders (VCs) notice the signal, as later-stage ventures deliberately communicate information to the investor.[12] Another assumption of signaling is that signals should be costly (Bird & Smith, 2005). This assumption refers to the context that some signalers are (high-quality signalers) are in a better position than others signalers (low-quality signalers) to absorb the associated cost of a signal (Connelly et al., 2011). In the context of later-stage financing, an example of a costly signal might be the acquisition of a reputable VC in a previous financing round, as it requires time, a strong network, a unique product, a high quality team and others. High-quality later-stage companies can expected to have a lower cost to have received these financing from top VCs, due to the quality of the company, relative to low-quality later-stage companies that would require to significantly change their team or product in order to receive this type of financing. Another example includes the revenue growth, whereas high-quality companies might have lower cost of showing high financial performance, low-quality companies might only be able to signal below average financial performance.

This leads to the first research question of this dissertation, which is to identify the information signals in a business plan or teaser that receivers (VCs) use to judge a later-stage venture. Signaling theory can help to identify the costly signals that are perceived as important to VCs and give an indication on their relative importance to other signals. By answering this research question, we can gain deeper insights into investors' actual decision-making. This way, the costly, and therefore valuable, signals can be identified (Bird & Smith, 2005). However, signaling theory does not fully help to describe why and which of the different signals in a business plan or teaser investors value as stronger or weaker. Table 2 provides an overview of the assumptions of signaling theory and argumentation of the applicability to the context of this dissertation. Signaling theory might help to identify signals and to hypothesize about the most important criteria used in later-stage financing. However it should be mentioned that some criteria might not possess the costly assumption of a signal.

[12] While signals are often sent intentionally, parties may also send signals without being aware of it (Spence, 2002; Janney and Folta, 2003). The later research design within this dissertation assures this observability condition in the research approach.

2.1.4 Additional theories in the context of VC decision-making

Signaling theory can be combined with principal-agent theory, cognitive theories, and resource-based view in the context of the research questions of this dissertation (Grossman & Hart, 1983; Wernerfelt, 1984; Gagné & Glaser, 1987; Wernerfelt, 1995; 1997; Kiener, 2013). Based on research relying on signaling theory, studies find that signaling effectiveness is associated with the receiver's characteristics to some extent. Following this argument, studies show that receivers interpret signals differently than other receivers do (Srivastava, 2001; Perkins & Hendry, 2005). Different receivers indeed process signals differently (Arthurs et al., 2009) and pay attention differently (Gulati & Higgins, 2003; Janney & Folta, 2006). Signals matter differently to different receivers to the extent that they correspond to different sought-after aspects of quality. The root cause of which information signal is more important than others are might lie in the investors' agency structures, goals, and resources, or cognitive structures of the individual decision-maker.

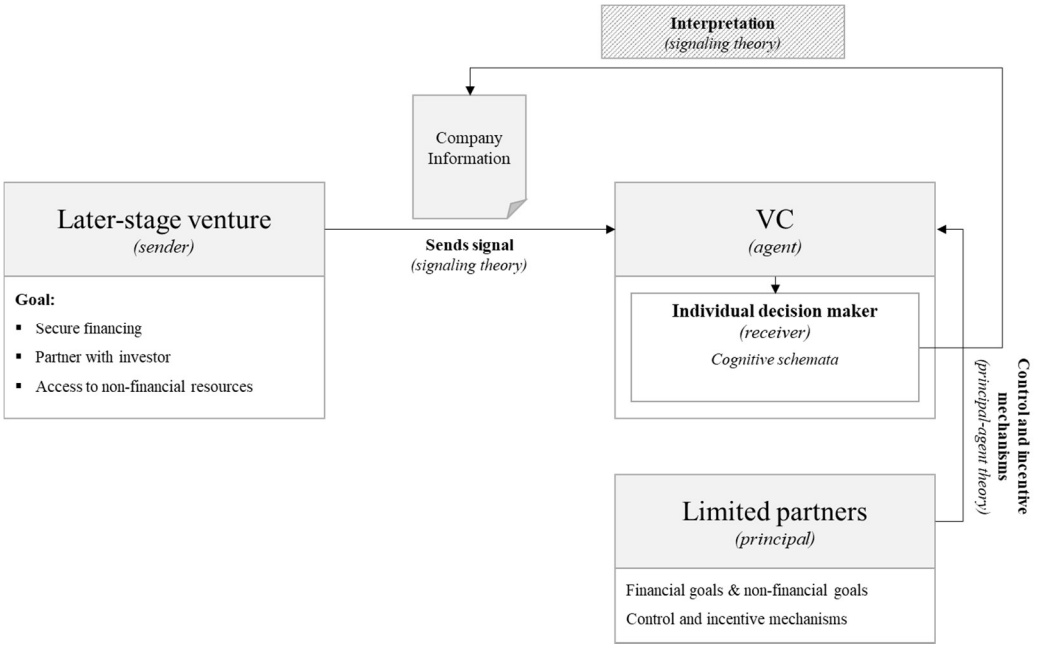
Starting with potential differences in the decision-making attributed to the individual decision-maker, this dissertation relies on the cognitive theory of cognitive schemata. Past research shows that cognitive structures in the form of experience can have an impact on an individual's decision-making (Shephard, 2003; Franke et al., 2006; Franke et al., 2008). A cognitive schema is the entirety of the facts, skills, experience, and concepts that an individual build over time. These schemata are linked with cognitive activities, such as decision-making. They are used for predicting, explaining, and reasoning. Research in cognitive research shows that individuals refine their schemata over time in various ways. For example, studies show that experienced individuals possess more complete schemata than do others, and experienced individuals allocate more domain-specific knowledge in a more productive way (Lurigio & Carroll, 1985; Shepherd et al., 2003; Matlin, 2005). Translating this theory into the context of this study, this might mean that the schemata of the individual decision-maker have a significant influence on VCs' decision-making. Aspects such as experience as investor, entrepreneurial background, educational background, or past performance might have created specific schemata that lead to different decision-making behavior in the context of later-stage ventures (Ucbasaran et al., 2010; Farmer et al., 2011). Surprisingly, these aspects have not been or are only rarely researched in the context of private equity investors' decision-making in entrepreneurial ventures.

Not only can cognitive schemata influence decision-making behavior, but the characteristics of the investment firm also can have an effect. Principal-agent theory and the resource-based view can provide a theoretical framework to explain differences based on the institution's

characteristics. Some VCs raise money from external parties, often referred to as limited partners (e.g., pension funds, governments, or corporations), in order to invest this capital into entrepreneurial ventures and later return a part of the profit to the limited partners. In this fundraising process, the limited partners and the management company / general partner contractually agree on the goals and rights of each party (Gompers & Lerner, 1999). This forms a principal-agent construct, as the limited partner (principal) provides capital to the management company (agent) in order to full-fill the agreed (mainly financial) goals. Different to VCFs or growth equity funds are CVCs or FOs, as they raise money from their mother company and do not need to approach multiple external limited partners.[13] Moreover, these institutions differ in their goals. Whereas VCFs or growth equity funds focus on financial goals, family offices try to achieve both financial and non-financial goals (Wessel et al., 2014), and CVCs try to achieve strategic and innovation goals (Dushnitsky & Lenox, 2005; Ernst et al., 2005; Dushnitsky & Lenox, 2006). To achieve these goals, all investors implement mechanisms (e.g., control mechanisms or incentive mechanisms). Assuming that these mechanisms are effective, we can assume different decision behavior. Since venture capital investment can be characterized as being long term, investors must also think about supporting a venture through its lifetime and the extent to which they can support their portfolio companies. Here, investors possess different levels of resources, which affect how the investment firm can support the portfolio company. Resources are both financial and non-financial, such as a network or reputation. Therefore, investors might prefer ventures that better match their resource composition. For example, if an investment firm has no significant network in foreign countries, internationalization might not be a relevant decision criteria, as the investor cannot support the portfolio company. All of these theories can help to shed light on VCs' decision-making. I combine these into the conceptual model in Figure 4.

[13] This is called "captive". Captive investors are those in which one shareholder contributes most of the capital, i.e. where the parent organization provides all the capital from its own resources (Invest Europe, 2007).

Fig. 4: Framework of theories in the context of VC decision-making



Source: Own illustration.

The presented framework provides hints on how different decision criteria are evaluated by VCs and will be used in later parts of this dissertation. Even though transmitting a strong costly signal that fulfill all assumptions from table 2, this signal might be differently interpreted by different VCs. This can be illustrated based on the following example. Strong historical revenue growth presented in a business plan might be a strong and costly signal for future firm value and therefore a high-quality firm, but if the investors of the VCs have implement incentive- and control-mechanisms that favor investments that do not incorporate risks that are introduced through such rapid growth, these investors might value this criteria differently than VCs that do not have the same incentive- and control-mechanisms. Another example includes aspects of the team of the later-stage company. A costly signal that can be transmitted to the VC might be the industry experience of the team, as it is difficult for low-quality teams to show the same kind of industry experience. However, this signal might be influenced by cognitive schema of the VC. Experienced VCs might value this signal higher than VC with fewer experience, as they might have gained knowledge on the importance of this signal for the development of the company they intent to invest in. Past research in this domain rarely relies on a theoretical framework to explain the findings, and can be characterized as mainly explorative. Many of the previous studies are data-driven and often do not find a theoretical explanation of their findings.

2.2 Literature review: Investment decision research

This subchapter provides a literature review of the past research focusing on the decision-making of VCs investing in entrepreneurial firms. It is divided into three subchapters focusing on investors' decision process when making a decision, the decision criteria VCs use, and external influences on this decision. I do this to draw the implications of this dissertation's research questions. Since decision-making is a key activity in the "venture capital cycle," it has drawn significant scholarly attention over the last 40 years in order to clarify the decision-making behavior.

2.2.1 Process research

The first relevant research stream that investigates decision-making takes a processual perspective. This research stream is often referred to as processual research and investigates the events and investors' actions to reach a decision (Silva, 2004). Market data and other studies show that investment decision in entrepreneurial ventures can take on average 7.8 months and are characterized by multiple events and actions, such as face-to-face meetings, document reviews, or external consultation (Petty & Gruber, 2011). In the end, 0.5-5% of all companies pass this decision process and receive funding (Feeney et al., 1999; Franke et al, 2004; Rao, 2013; Mullins, 2014). By investigating these events and the actions investors take to come to a decision, we can gain a deeper understanding of decision-making behavior and identify further implications in the context of this dissertation.

The first insight into how the decision process is structured by VCs is rooted in the 1970s, when Wells (1974) conducted the first study with eight VCs on their decision-making and identified three actions they perform to come to a decision. These include the search for investment opportunities, screening proposals, and a detailed evaluation of investment proposals. This first process that Wells describes starts with a search for potential investment opportunities to generate what is often called "deal flow." Deal flow in practice is a database of ventures that express interest in receiving funding, or ventures that the investors have an interest in. After creating this database, the investor starts to screen all ventures by investigating their fit with the investor's strategy and applying specific screening criteria. Investors often do this by investigating the documents received from the venture, such as business plans or teasers. Following this, several physical interactions are arranged between the investor and the management team of the venture in order to exchange additional information. If the outcome of this

evaluation is positive, the investor drafts and submits contracts to the venture to reach a contractual agreement on a deal.[14] Following this first study by Wells (1974), other studies by Tyebjee & Bruno (1984), Fried & Hisrich (1994), Boocock & Woods (1997), Bliss (1999), and Silvia (2004) shed further light on the decision process. Tyebjee & Bruno (1984) conduct a study of 46 VCFs located in several US states to validate a decision-making process that the researchers previously drafted. The drafted decision-making process enlarges the three step model from Wells (1974) by two additional steps. In their study, VCs' decision process starts again with deal origination followed by screening activity, in which the investor tries to limit the investment opportunities by excluding opportunities not in the focus size, geographical location, industry, and stage of financing. Following this generic screening, investors evaluate the venture using various decision criteria, such as the uniqueness of the product, size of the market, or management skill. Based on Tyebjee & Bruno (1984), this activity includes reviewing the business plan and elaborating on the specific decision criteria. Different to Wells (1974), their study introduces two additional process steps. The first being the deal structure, in which investors structure a mutual agreement and draft contractual elements, such as the price or liquidation preferences. This occurs only if the VC has an interest in the company. The second is the last step, which is the post-investment phase. After signing a contract, investors support the portfolio company in their day-to-day operations by providing guidance and resources. However, this decision process step sums up all activities after a contractual agreement has been reached, and hence I do not consider this as a part of the decision process.

Following the study by Tyebjee & Bruno (1984), studies by Fried & Hisrich (1994), Boocock & Woods (1997), and Bliss (1999) extend the work by describing Tyebjee & Bruno's (1984) screening process in two sub processes: generic screening / initial screening and proposal assessment. Generic screening / initial screening are the first activities, which exclude opportunities not in the focus size, geographical location, industry, and stage of financing, as Wells (1974) describes. Today, this activity is sometimes done with the support of software and algorithms to filter out these companies without human interference (Kamps, 2016). The second sub process is often called proposal assessment and is the first time an investment professional assesses the teaser or business plan after passing the generic screening / initial screening. In addition, these studies split the evaluation process step into two sub processes. After passing

[14] Contracts are also called "term sheets" in the venture capital industry. These contracts contain various types of rights, including information rights, control rights, or cash-flow rights, such as liquidation preferences (Hellmann, 1998; Kaplan & Strömberg, 2004).

the initial assessment of the teaser or business plan, the investor undertakes a first evaluation phase in which the investor and the company have their first face-to-face meeting to exchange additional information and often to pitch their company and product to the investor. If this results in a positive decision by the investor, this leads to a due diligence phase as part of the evaluation process step. Within this sub process step, the investor requests and reviews additional documents, question customers, or seek external consultations to identify and mitigate risk. If this process step is passed, the investor is willing to engage in a contractual arrangement with the company. This is the process step after evaluation and is often referred to as deal-closing or deal-structuring. All of the studies cited above extend the initial methodology of interviews and surveys to archival document analysis and verbal protocols. Additionally, the initial bias towards US-based investors was mitigated by questioning other investors from different locations. However, extending both the methodological and geographical context did not reveal novel differences in the decision process compared to existing studies.

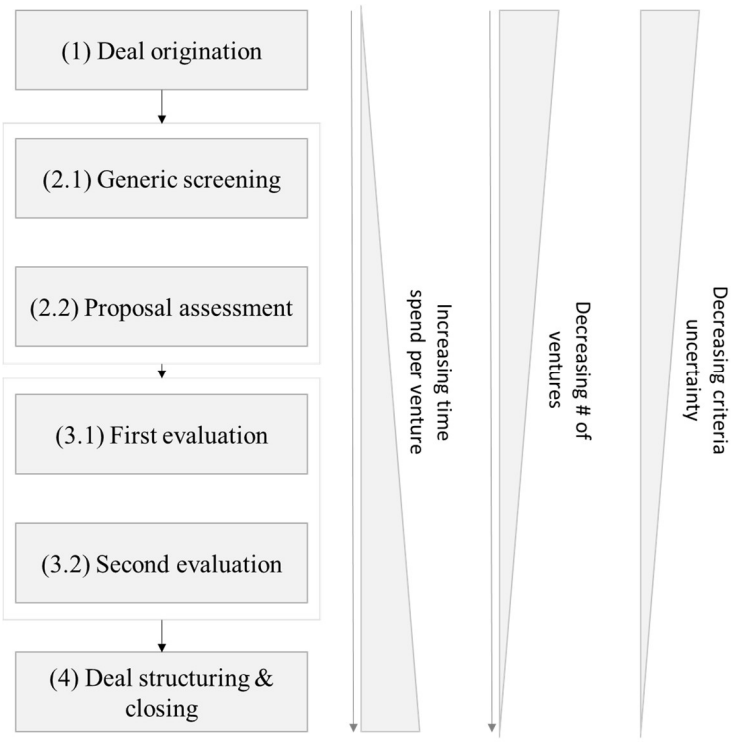
These studies provide the first insights for the context of this dissertation, as they reveal no major difference in the activities of investors that focus on early-stage or later-stage investments. However, other studies reveal that late-stage investors take more time to assess an investment opportunity (Elango et al., 1995).

Furthermore, the time spent per venture increases over the entire decision process, with a simultaneous decrease in the number of ventures passing each process step. Around 20% of all ventures are rejected through generic screening. Interestingly, before the first physical contact with an investor, around 80% of ventures from the deal flow are rejected, significantly reducing the number of investment opportunities (Franke et al., 2004). This makes this process step particularly relevant for researchers and practitioners, as investors confront a dilemma. The dilemma is that investors face two types of risk: (1) rejecting ventures with potential above-average future returns and (2) accepting ventures with below-average future returns. Past research describes this as the investor's difficulty in assessing the future likelihood of a venture's success or failure (Fried & Hisrich, 1994; Bergemann & Hege, 1998). Especially, as this process rejects the largest number of ventures, this problem is particularly important and uncertainty about future success is high (Kollmann & Kuckertz, 2010).

Summarizing the previous literature in this field, investors perform around five distinctive activities in order to decide if they will make an investment. The activities in the first process steps to efficiently filter out companies outside of the investor's focus can be characterized as being not highly time-intensive. Later activities to detect the most promising companies are

more time consuming. The activities range from document reviews to meetings on-site with the management team, whereas in the first process steps, the investors make decisions using documents and only in the later process steps is there physical interaction. In the context of the later-stage ventures in this dissertation, the proposal assessment step is particularly important due to the number of companies assessed and the uncertainty of the future returns of the venture. Figure 5 describes the main process steps that private equity investors take based on previous research, including the decreasing number of ventures through the decision process and the increasing time spend per venture.

Fig. 5: Decision process of VCs



Source: Own illustration based on Wells (1974), Tyebjee & Bruno (1984), Fried & Hisrich (1994), Boocock & Woods (1997), Kollmann & Kuckertz (2010), and Petty & Gruber (2011).

In addition, more recent studies by Kollmann & Kuckertz (2010) and Petty & Gruber (2011) focus on the interaction between the decision process and decision criteria (Chapter 2.2.2.) and show that different decision criteria matter for different process steps. Kollmann & Kuckertz (2010) use a survey study of 81 VC investment managers from Germany, Austria, and Switzerland to show that in the early steps of the decision process, management criteria are highly uncertain, while at the end of the decision process, other criteria are associated with high uncertainty. These studies indicate that different criteria matter in different steps in the decision

process due to their uncertainty. Intellectual property is one example because it is difficult to assess in the early stages of the process, whereas in the due diligence process step, this might be of high importance and easier to assess.

However, current research on the decision-making process of VCs is limited in its theoretical contribution. Only a few studies rely on theories such as information economy theories (principal-agent theory or signaling theory) or the search, experience, and credence quality clues (SEC) framework to explain the structure of and activities in the decision process (e.g., Fried & Hisrich, 1994; Kollmann & Kuckertz, 2010). However, the vast majority of studies do not rely on a theory to explain their findings. Because of the importance of the proposal assessment process step within the overall decision process, this study focuses on this particular aspect in the context of later-stage venture investments. Moreover, past studies did not indicate any significant difference between the decision process used regarding early-stage ventures vs. later-stage ventures.

2.2.2 Criteria research

Within the decision process above, investors confront the challenge of using the information available to them in order to come to a decision. The investor needs to interpret the information signals that a venture transmits (often in the form of business plans, teasers, or in later stages of the decision process, face-to-face meetings) (Connelly et al., 2011). The research stream that investigates this context is referred to as decision criteria research, which tries to identify the relevant decision criteria and evaluate the weights / relative importance that investors attribute to this decision criteria or information signals.

The first studies date back to the 1970s. Here, Wells (1974) and Poindexter (1976) were among the first to try to identify the decision criteria and to assess the importance that investors attribute to these decision criteria. Wells (1974) and Poindexter (1976) survey VCs in the US. Wells (1974) uses personal interviews with eight VCFs to identify and rate decision criteria, whereas Poindexter (1976) uses questionnaires of 97 VCFs. Both conclude that VCs put particular importance on the quality of the management team when making a decision. While Poindexter finds that after the management team, investors put particular weight on exit or deal characteristics (e.g., expected rate of return or equity stake taken), Wells finds that product and market characteristics follow the management team characteristics in terms of importance. Both identify other decision criteria such as the marketing, engineering, financial, and manufacturing skills of the entrepreneurs, tax shelter considerations, venture development stage, and many others. These two explorative studies shed the first light on the decision criteria, but were vague about the decision criteria and suffer from local, stage, and methodological biases. Following these initial studies, Tyebjee & Bruno (1981) question 46 VCs via a telephone survey using open-ended questions with a post-hoc categorization of the responses about their investment criteria. In contrast to the two previous studies, they identify different decision criteria and a different order of importance for the various criteria. They identify the skills and history of the management team as the most important decision criteria, followed by the market size, rate of return, and positioning in the market. Similar to Wells and Poindexter, Tyebjee & Bruno (1981) remain vague in their decision criteria and suffer from similar biases. After their initial study in 1981, Tyebjee & Bruno (1984) extend their study of 46 VCs by an additional set of 41 VCs located in California, Massachusetts, and Texas. They sort the identified decision criteria into five groups with a factor analysis to provide the first high-level overview of the decision crite-

ria, which consist of market attractiveness, product differentiation, managerial capabilities, environmental threat resistance, and cash-out potential. However, the initial decision criteria in these five groups do not significantly differ compared to their previous study.

MacMillan et al. (1985) replicate Tyebjee & Bruno's (1981) study with a new set of participants and survey 100 VCs in the US on 24 identified decision criteria. They reach similar conclusions as Tyebjee & Bruno (1981) do, but also find that investors shift their importance away from individual skills (e.g., marketing or financial skills) to the quality of the entire management team. They attribute this to the change in the VC industry at the time. Similar to Tyebjee & Bruno (1984), MacMillan et al. (1985) group the 24 identified decision criteria into six risk categories. The authors argue that VCs mainly use the various criteria to evaluate different risk factors, as their main task is to manage the risk of a new venture. Moreover, the authors try to group the decision criteria into five groups: (1) entrepreneurs' personality, (2) entrepreneurs' experience, (3) product characteristics, (4) market characteristics, and (5) financial considerations. Similar to previous studies, the decision criteria remain vague and unspecific. Moreover, these studies do not distinguish between the types of venture that the investors invest in and only ask about the VC's decision criteria in a very general fashion, ignoring the link to the investor's decision process.

Knight (1986) also replicates Tyebjee & Bruno's (1981) study with 181 VCs, but extends the geographical scope of the study to the US and Canada. Compared to the previous studies, Knight (1986) gives the first indication that only minor difference in the importance of various decision criteria might exist for investors in different geographies. However, he does not provide arguments for these descriptive findings. In the vein of these replication studies, MacMillan et al. (1987) undertake another replication study with the same set of decision criteria as Tyebjee & Bruno (1981). Based on the same 24 criteria, they ask VCs how they rate these 24 characteristics of one successful and one unsuccessful venture they funded in the past. Their major finding is that unsuccessful ventures appeared similar to the successful ventures, but often differ only in a single decision criteria. Additionally, they argue that ventures need several characteristics in combination to be successful, but many VCs invest, even though there are no success signals, and therefore rely on luck.[15] Nevertheless, this study is one of the first

[15] This argument shows in the researchers' statement: "Thus, it is not surprising that venture evaluation remains an art, a long way from becoming a science." MacMillan et al. (1987 pp. 129).

to show that the combination is important, and the decision criteria therefore require a multivariate representation rather than being evaluated in isolation. Khan (1987) takes a different angle on VCs' decision-making by analyzing whether venture capital investors use a conjunctive decision model (e.g., minimum level of several decision criteria) or disjunctive decision model (e.g., one criteria needs to be very high in order to proceed with the venture). Via interviews, he concludes that investors use a mix of both types of models, and indicates how these decision models correlate with the performance.

After the initial studies from 1974 to 1987, Sandberg et al. (1988) were the first to criticize the previous findings. In their study, they argue that scholars often do not distinguish between different types of VCs, instead treating this diverse industry as a homogeneous group. Moreover, they argue that earlier researchers identify decision criteria that are quite general and vague (e.g., "quality of management"). In addition, they criticize the fact that some decision criteria focus on the end of the decision process rather than what VCs think in the beginning (e.g., expected rate of return), and therefore ignore the actual characteristics of the decision-making process. Furthermore, Sandberg et al. (1988) is the first study to use verbal protocols to get further insights into decision-making. Through this method, it is possible to provide a more in-depth analysis of the actual decision-making. However, due to this time consuming method, only one participant was part of their study, questioning the potential representatives of their findings. They conclude that VCs first look at the product and financials, and only later at the management team. They argue that the majority of the thoughts relate to strategy and financial performance, and not the team. They thus question the findings from studies such as MacMillan et al. (1985), who argue in their paper that:

> *"There is no question that irrespective of the horse (product), horse race (market), or odds (financial criteria), it is the jockey (entrepreneur) who fundamentally determines whether the venture capitalist will place a bet at all."*
>
> *[MacMillan et al. (1985), pp. 119]*

Relevant for the context of this thesis in particular is their finding that nearly no previous study considers that the weight of decision criteria can differ by type of venture or industry. Following this methodological advancement, Hisrich & Jankowicz (1990) use a repertory grid methodology to investigate the intuition in the VC investment decision process. They ask five VCs to recall six past investments: two proposals that were "big hits," two with average performance, and two that were not supported. They then asked participants to rate each on an evaluation grid consisting of various decision criteria (e.g., good vs. bad management, national

scope vs. local scope, or common track record vs. a unique track record). The outcome was that decision criteria can be grouped into three main groups: (1) management aspects, (2) unique opportunity, and (3) appropriate return. The study argues that the first group of decision criteria consists of the entrepreneur's experience, personality, and track record; the characteristics of the management team; and "personal chemistry." Nevertheless, their study has some methodological shortcomings, such as recall bias, and it is based on only five investment managers.

Riquelme & Rickards (1992) adopt another methodical advancement to overcome the biases resulting from surveys and interviews in previous studies. By adopting conjoint analysis in this research domain, they introduced a new way to measure decision-making. In contrast to previous methods, they argue that verbal protocols can be a first basis for understanding decision-making behavior, but are also "more than an art than a science." They employ different conjoint analysis with 13 VCs against a self-explicated model. They find a high degree of consistency between the conjoint and hybrid conjoint analysis, and that both outperform self-explicated models in explanatory power. In addition to this methodological question, they provide evidence that in the first stage of the decision process (generic screening), VCs focus on a small subset of criteria in a non-compensatory process. In the second stage (assessment and due diligence), VCs conduct a detailed examination by compensatory rules, emphasizing the need for multivariate techniques in order to capture decision-making properly. This might explain Khan's (1987) findings from conjunctive decision models versus disjunctive decision models. Moreover, they also show the first evidence that not every decision-maker follows the same decision rules. Following this argument, Carter & Van Auken (1992) try to assess the differences between VCs in terms of having a business background versus a non-business background. By asking 72 VCs about their professional background and rating specific decision criteria, they show that non-business background venture capitalists put more importance on decision criteria such as the uniqueness of the product, the cost structure of the project, and the entrepreneur's health, and less on exit procedures. However, their measure of business background versus non-business background remains unclear and these studies suffers from methodological and sample biases.

Because of the mixed findings from previous studies, Hall & Hofer (1993) execute another verbal protocol analysis of four US-based VCs. In addition to the findings on the decision criteria used, they also find that VCs screen and assess proposals very rapidly (less than 6 minutes on initial screening and less than 21 on proposal assessment). This can be interpreted as evidence for a limited set of decision criteria and the need for multivariate analysis. Again,

in contrast to previous findings, they show that VCs did not put much importance on the entrepreneur, management team, or strategy during the early stages of the evaluation process. They also argue that previous research did not distinguish between the decision criteria in the different decision processes stages, resulting in the mixed findings. Based on these mixed findings, Fried & Hisrich (1994) attempt to shed light on this research stream by investigating the decision process further rather than the decision criteria. However, they give the first evidence of potential differences in the decision criteria for early stage and later stage ventures. By interviewing 18 VCs they find that due to different information levels, early-stage investors assess different aspects compared with later-stage investors. For example, they find that flexibility is especially important for early-stage ventures compared to later-stage ventures. Despite the potential biases in older studies from MacMillan et al. (1985) and Tyebjee & Bruno (1981), Knight (1994) conducts another replication study, this time with a cross-country perspective. In his study with 429 participants from the US, Canada, Asia, and Europe, he finds that the importance attributed to the decision criteria from Tyebjee & Bruno (1981) can differ by region, but are very similar in the majority of cases.

Because of the minor advancements and remaining biases in previous studies, Muzyka et al. (1996) execute a conjoint study to mitigate these shortcomings by asking three key questions: 1) What are the key factors for European VCs in evaluating potential investments? 2) Do VCs throughout Europe consistently apply these factors? 3) Is there any clustering of VCs based on their decision criteria? In addition to answering these questions, they argue that the methodology used to assess decision-making is a key question, as researchers should not present VCs with a "laundry list" of criteria via Likert-scale ratings. Answering the first question, the scholars hypothesize that the management team is the most important decision criteria for VCs, followed by a competitive market position and the management team's ability to execute the business plan. Of minor importance were the decision criteria associated with the deal itself (e.g., the fit with the fund). Regarding the second question and in line with previous research, they do not find significant differences in the criteria across European countries. Despite their findings, the criteria evaluated consist of decision criteria from previous research and therefore remains, in some parts, vague and general.

Until 1996, the majority of previous studies focused on institutional VCs, despite the fact that other investors also invest in entrepreneurial companies. Bachher & Guild (1996) were therefore one of the first to investigate other investor types and their decision-making behavior. Bachher & Guild (1996) compare business angels and VCFs in their decision criteria. Their

study of 40 VCFs and 20 business angels from Canada finds evidence that both types of investors see the management team as the most important decision criteria. In addition to many similarities in the decision-making criteria used for early-stage ventures, they also find differences. In contrast to business angels, VCFs tend to assign more importance to market characteristics (e.g., market size or growth) than business angels do, who emphasize the venture offering (e.g., uniqueness). Bachher & Guild argue that such studies help entrepreneurs find better matches with investors and therefore make fundraising easier. A case-study by Mason & Harrison (1996) of business angels' reasons to reject business opportunities reveals similar results, as the majority of rejection criteria were related to the management team's characteristics and the entrepreneurs personality (e.g., ability to listen). Another study (Feeney et al. (1999)) on business angels' decision criteria for early-stage ventures shows similar results, as business angels seem to reject ventures due to personality reasons (e.g., lack of realistic expectations or lack of personal qualities such as integrity or vision). Based on these findings, business angels seem to have a significant focus on personality aspects compared to institutional VCFs.

Because of the bias towards US-based investors in previous studies, Karsai et al. (1997) provide one of the first studies investigating decision criteria in young and underdeveloped VC markets. In their study on Hungarian VCs, they find that Hungarian VCs' most important decision criteria are the timing and nature of the exit, entrepreneurs' knowledge in their field, and financial data. Interestingly, they do not consider entrepreneurs' past experience as being very important.

In a critical paper entitled "A lack of insights: do venture capitalists really understand their own decision process?" by Zacharakis & Meyer (1998) further question previous findings due to methodological shortcomings. One of their main findings is that, in contrast to the large number of decision criteria previous studies list, people have a tendency to overstate the information they believe they relied upon and to use far less information (typically three to seven factors) to make a decision. Based on their conjoint methodology to study "actual decision-making" combined with a survey to measure decision-making ("stated decision-making") of 53 venture capital investors, they argue that past research might have been misleading, as the "entrepreneur factor" does not seem to be that important to VCs. By comparing results from both methods, the authors show that the product and market characteristics of the venture seem to be more relevant in actual decision-making compared to those in the stated decision-making. This study is the first to compare these two ways of measuring decision-making directly. In a similar

vein, Shepherd & Zacharakis (1999) emphasize the described importance of measuring actual decision-making compared to post-hoc methods that can suffer from several biases.

Following the methodological advantages of conjoint analysis, Shepherd and others published several studies on VC decision criteria using conjoint analysis (Shepherd, 1999a; Shepherd, 1999b; Shepherd et al., 2000; Zacharakis & Shepherd, 2001; Shepherd et al., 2003). The result are in line with Zacharakis & Meyer (1998), in that they show that significant differences between self-reported decision policies and results from conjoint analysis exist regarding the importance of the decision criteria (Shepherd, 1999a). Besides these insights, Shepherd (1999b) is the first study that questions the decision criteria identified in former studies in the context of later-stage ventures. He raises the question of whether other criteria exist for later-stage-ventures (including different criteria weighting):

> *"This study focuses on VCs' assessment of new ventures, i.e., investment proposals seeking seed to development capital. An interesting question then becomes:* ***Do VCs weight criteria differently in their assessments of businesses in different stages of development?*** *For example, where uncertainties over the future environmental conditions and the appropriateness of specific strategies are reduced (e.g., mezzanine financing or leveraged buyouts), do VCs rely less on the quality of the management team in their assessment of a firm's probability of survival?* ***Do VCs use different criteria for their assessments of businesses in later stages of development?****"*
>
> *[Shepherd, 1999b, p. 630 – text not highlighted in the original]*

Next to the methodical implications and suggesting that researchers focus on the stage, Shepherd (1999b) also investigates the relative importance of VCs' decision criteria for seed-stage ventures. The author concludes that the industry-related competence of the team and educational capabilities are the most important decision criteria based on a conjoint experiment with 47 Australian VCs. These respondents attached less importance to competitive rivalry, lead time, and entry timing. Mason & Stark (2004) made another attempt to compare decision criteria across different investors. Compared to earlier studies, they also include debt investors. The authors compare verbal protocols from 10 investors, of which 3 are banks, 3 are VCFs, and 4 are business angel. They conclude that bankers assign the biggest importance to financial aspects (e.g., profit or collateral) and only a very small weight to the entrepreneur (9%) or market characteristics (12%). In contrast, VCs assign the biggest importance to market issues (22%), financial issues (21%), the entrepreneur (12%), and the strategy (11%), whereas business angels focus mainly on the entrepreneur (16%), as they invest in "the people." Their verbal protocol analysis indicates that that the entrepreneur is not the primary determinant at the initial screening stage for VCs.

Based on studies that identify the management team and the entrepreneur as the most important decision criteria, a conjoint study on German and Austrian venture capital investors was conducted with a focus on the management team as the key decision criteria (Franke et al., 2004; Franke et al., 2006; Franke et al., 2008). Based on the same data, Franke et al. (2004), Franke et al. (2006), and Franke et al. (2008) investigate specific management team decision criteria such as the acquaintance among team members, experience in leading teams, or the age of the team members. One of the main conclusions is that industry-related experience, type of education, and leadership experience are the most important criteria to venture capital investors. Relying on previous studies, they draw on findings from the 1970s and investigate only early-stage ventures. Other studies on venture capital investors in small equity markets (Silva, 2004) and US-based business angels (Sudek, 2007) followed. However, these studies provide little additional insights into the decision criteria already identified. A rather novel study by Kollmann & Kuckertz (2010) investigates the conjunction of decision criteria and decision process research by studying 81 venture capital investment managers in Germany, Austria, and Switzerland. The authors find that in the early steps of the decision process, the management team criteria is of particular interest due to its related uncertainty, whereas in the later process, the opposite is the case. This is one of a very few studies that investigate decision criteria in the context of the various decision steps.

Petty & Gruber (2011) also attempt to better understand decision criteria using archival research through the memos, records, notes, and emails of a single VCF. In addition to several findings on the decision process, the authors contribute to the ongoing debate on the importance of the team for VCs and show that the management team is the least important. More important are market- and product-related characteristics. Some argue that despite the importance investors attribute to the team, empirical evidence indicates that VCs often replace management team members before or after an investment (Bruton et al., 2000; Petty & Gruber, 2011).

Hsu et al. (2014), Nunes et al. (2014), and Block et al. (2014) conduct additional studies. Hsu et al. (2014) confirm that the relative importance of a decision criteria can vary by type of investor. In addition, Nunes et al. (2014) provide further insights into the decision criteria in Portugal, but uses the same decision criteria as MacMillan et al. (1985) do. Nevertheless, the study is one of few that try to investigate the difference between early- and late-stage investors. Block et al. (2014) take a different angle by investigating the effect of trademarks on VC financing using US-centric data from 1998-2007. They focus on a single decision criteria (trademarks) and find that trademarks become less important in startup evaluation in the later stages,

as more information is available (sales data, etc.). However, they only indirectly measure decision-making by looking at historical data, exposing these findings to several limitations.

As investors primarily look at teasers and business plans when evaluating a venture, Chan & Parker (2015) investigate a new decision criteria: the graphical appearance of the business plan and its influence on the decision. Based on quasi-experiments, they show that product pictures and the colors used can increase the likelihood of a positive decision.

Summarizing the decision criteria research since 1974, there are several limitations and remaining questions. The vast majority of studies remain vague and general in the decision criteria they use and identify. Aspects such as "quality of the management team" are difficult to make sense of for both practitioners and academics. That is why researchers are seeking more specific decision criteria. Next to the vague characteristics of the decision criteria, there is still an open question as to the most important decision criteria. Many studies report that the management team is the most important, whereas others heavily criticize this finding and provide other results. Despite several findings that indicate that investors use a decision approach in which they assess multiple criteria simultaneously and compensation effects between decision criteria exist, many studies still rely on surveys with Likert scale ratings. This is an important limitation of previous studies, as actual decision-making is often not measured, and only self-reported information is recorded. Besides this methodological limitation, much decision criteria research is done with US-based investors. This is another bias in past research, though the US is the most active market for VC investment in entrepreneurial firms. Past research also often has less than 100 participants, further questioning the representativeness of existing findings. Moreover, studies investigating decision criteria for other types of investors, such as CVCs or FOs do not exist, despite their economic importance. Additionally, current research in this domain lacks theoretical foundations, as many studies are explorative and data-driven. However, the most important aspect of the literature is that no research exists that specifically distinguishes the stage of the venture that investors assess.

Table 3 provides a systematic overview of past decision criteria research into private equity investors, including the sample size, the collection method used to capture decision policies, the lifecycle stage of a venture the study focuses on, and the description of the type of venture. As Table 3 shows, one set of studies focuses on early-stage ventures and another that does not define the object (venture) investors actually assess when investigating decision criteria. Many of these studies ask investors about their "general" decision criteria, often leading to vague results (e.g., quality of the management team).

Tab. 3: Literature review: venture types

Study	*Collection method*	*Lifecycle focus of study*	*Description of the type of venture in study*
Tyebjee & Bruno (1981) *N=46*	*Questionnaire*	*N.A.*	*Not specifically defined – treats ventures as a homogeneous and universal group*
MacMillan et al. (1985) *N=100*	*Questionnaire*	*N.A.*	*Not specifically defined – treats ventures as a homogeneous and universal group*
Knight (1986) *N=181*	*Questionnaire*	*N.A.*	*Not specifically defined – treats ventures as a homogeneous and universal group*
MacMillan et al. (1987) *N=67*	*Questionnaire*	*N.A.*	*Not specifically defined – treats ventures as a homogeneous and universal group*
Sandberg et al. (1988) *N=1*	*Verbal protocol*	*N.A.*	*Not specifically defined – participant mainly focusses on seed- and early-stage deals*
Riquelme & Rickards (1992) *N=13*	*Conjoint experiment*	*Early-stage ventures*	*Business startups*
Hall & Hofer (1993) *N=4*	*Verbal protocol*	*Mixed stages*	*Not specifically defined – "Wide range of businesses, including both high-technology and service ventures, and including requests for start-up, second stage, and leverage buy-out funding"*
Fried & Hisrich (1994) *N=18*	*Case study*	*Mixed stages*	*Not specifically defined – "seed, first, second, management buyout, leveraged buyout and recapitalization"*
Knight (1994) *N=429*	*Questionnaire*	*N.A.*	*Not specifically defined – treats ventures as a homogeneous and universal group*
Bachher & Guild (1996) *N=60*	*Questionnaire*	*Early-stage ventures*	*"The early stages encompass seed, start-up and first-stage, at each of which the company has different requirements for financing"*
Zacharakis & Meyer (1998) *N=53*	*Conjoint experiment*	*Early-stage ventures*	*Not specifically defined – clue in study: "Time to development—number of months from initiation of develop to the initial sale as forecast in business plan"*
Feeney et al. (1999) *N=194*	*Interviews*	*N.A.*	*Not specifically defined – treats ventures as a homogeneous and universal group*
Shepherd (1999a) *N=47*	*Conjoint experiment*	*N.A.*	*Not specifically defined – treats ventures as a homogeneous and universal group*

Shepherd (1999b) *N=47*	*Conjoint experiment*	*N.A.*	*Not specifically defined – points out that future research should answer the question: "Do VCs use different criteria for their assessments of businesses in later stages of development?"*
Shepherd et al. (2000) *N=64*	*Conjoint experiment*	*N.A.*	*Not specifically defined – treats ventures as a homogeneous and universal group*
Mason & Stark (2004) *N=10*	*Verbal protocol*	*Mixed stages*	*Not specifically defined – three proposals called startup funding, first phase of expansion and early-stage expansion*
Silva (2004) *N=1*	*Participant observation*	*Early-stage ventures*	*Early-stage proposals refer to proposals in the seed or start-up stage*
Franke et al. (2004); Franke et al. (2006); Franke et al. (2008) *N=51*	*Conjoint experiment*	*Early-stage ventures*	*Early stage venture as: A working prototype exists; potential users are small and medium-sized industrial firms; value proposition is clearly visible; project is based on a patented technical product; considerable cost savings for users*
Kollmann & Kuckertz (2010) *N=81*	*Questionnaire*	*N.A.*	*Not specifically defined – treats ventures as a homogeneous and universal group*
Petty & Gruber (2011) *N=1*	*Archival research*	*N.A.*	*Not specifically defined – mentions: "Stage of the company mentioned as a relevant decision criteria in the decision process"*
Block et al. (2014) N=2,671	*Secondary transaction data*	*Mixed stages*	*Seed or early investment stage – not further defined in the study*
Nunes et al. (2014) *N=20*	*Questionnaire*	*Early-stage ventures*	*Early-stage VC projects – not further defined in the study]*
Hsu et al. (2014) *N=85*	*Conjoint experiment*	*Early-stage ventures*	*Early-stage investment opportunity – not further defined in the study*
Chan & Parker (2015) *N=644*	*Conjoint experiment*	*Mixed stages*	*Not specifically defined*

Note: N.A. = not available

Many researchers flag this issue (e.g., Shepherd, 1999b), but so far very limited knowledge exists on what decision criteria investors use for later-stage ventures, despite their economic importance. This question is at the heart of this dissertation. Table 4 till table 8 provide a comprehensive overview of the decision criteria and process research since 1974. These tables provides evidence of limitations regarding sample size, location, methodology, and stage focus.

Only a few studies touch on the topic of the varying decision criteria across the development cycle. Fried & Hisrich (1994) provide initial evidence of potential differences in decision criteria between early- and later-stage ventures. By interviewing 18 VCs, they find that due to different information levels, early-stage investors assess different aspects than later-stage investors do. For example, the flexibility of the business is especially important for early-stage investors compared to later-stage investors. Elango et al. (1995) conduct a similar study. Through a questionnaire of 149 VCs, they find that investors that focus on early-stage ventures emphasize proprietary products, product uniqueness, and high growth markets in their decision-making, whereas late-stage investors showed higher interest in demonstrated market acceptance. Nunes et al. (2014) conduct a questionnaire of 20 Portuguese VCs to identify the importance they assign to various decision criteria when evaluating early-stage ventures. They find that late-stage investors assign less importance to the company's ability to create a new market for the product or service and financial characteristics compared to early-stage investors. However, similar to Nunes et al. (2014), all of these studies do not specifically investigate the decision behavior in case of later-stage ventures, as they only split the sample of investors into two investor types depending on their stage preference. These results, however, are rather preliminary and no conclusions can be drawn if other decision criteria are used for ventures in later stages of development. Whether the decision criteria identified in previous research are transferable to the context of later-stage ventures is therefore questionable. Here, different costly signals might exist for later-stage ventures than for early-stage ventures, due to different information available and different goals, risks and needs of later-stage ventures.

Tab. 4: Literature review: Sample size and country focus

	Wells (1974)	Poindexter (1976)	Tyebjee / Bruno (1981)	Tyebjee / Bruno (1984)	MacMillan et al. (1985)	Knight (1986)	MacMillan et al. (1987)	Khan (1987)	Sandberg et al. (1988)	Riquelme / Rickards (1992)	Carter / Van Auken (1992)	Hall / Hofer (1993)	Fried / Hisrich (1994)	Knight (1994)	Muzyka et al. (1996)	Bachher / Guild (1996)	Karsai et al. (1997)	Boocock / Woods (1997)	Zacharakis / Meyer (1998)
Sample size	8	97	46	41 & 46	100	181	67	36	1	13	72	4	18	429	73	60	12	1	53
Investor country																			
USA	X	X	X	X	X	X	X	X	X		X	X	X	X					X
Canada						X								X		X			
Germany															X				
France															X				
Hungary																	X		
Poland																			
Portugal															X				
Spain															X				
Belgium															X				
Netherlands															X				
Italy															X				
Austria															X				
Switzerland															X				
Ireland															X				
United Kingdom															X			X	
Australia																			
Unknown										X				X					

	Feeney et al. (1999)	Shepherd / Zacharakis (1999)	Shepherd (1999a)	Bliss (1999)	Shepherd (1999b)	Shepherd et al. (2000)	Zacharakis / Shepherd (2001)	Shepherd et al. (2003)	Mason / Stark (2004)	Franke et al. (2004)	Silva (2004)	Franke et al. (2006)	Sudek (2007)	Franke et al. (2008)	Kollmann / Kuckertz (2010)	Petty / Gruber (2011)	Hsu et al. (2014)	Nunes et al. (2014)	Block et al. (2014)
Sample size	194		47	6	66	66	51	66	10	51	1	51	72	51	81	1	85	20	/
Investor country																			
USA							X						X						X
Canada	X																		
Germany										X		X		X	X				
France																			
Hungary																			
Poland				X															
Portugal											X							X	
Spain																			
Belgium																			
Netherlands																			
Italy																			
Austria															X				
Switzerland															X				
Ireland																			
United Kingdom									X										
Australia			X		X	X		X											
Unknown													X						X

Tab. 5: Literature review: Region focus

	Wells (1974)	Poindexter (1976)	Tyebjee / Bruno (1981)	Tyebjee / Bruno (1984)	MacMillan et al. (1985)	Knight (1986)	MacMillan et al. (1987)	Khan (1987)	Sandberg et al. (1988)	Riquelme / Rickards (1992)	Carter / Van Auken (1992)	Hall / Hofer (1993)	Fried / Hisrich (1994)	Knight (1994)	Muzyka et al. (1996)	Bachher / Guild (1996)	Karsai et al. (1997)	Boocock / Woods (1997)	Zacharakis / Meyer (1998)
Investor region																			
North America	X	X	X	X	X	X	X	X	X		X	X	X	X		X			X
South America																			
Europe														X	X		X	X	
Africa																			
Asia														X					
Oceania																			
Unknown										X									

	Feeney et al. (1999)	Shepherd / Zacharakis (1999)	Shepherd (1999a)	Bliss (1999)	Shepherd (1999b)	Shepherd et al. (2000)	Zacharakis / Shepherd (2001)	Shepherd et al. (2003)	Mason / Stark (2004)	Franke et al. (2004)	Silva (2004)	Franke et al. (2006)	Sudek (2007)	Franke et al. (2008)	Kollmann / Kuckertz (2010)	Petty / Gruber (2011)	Hsu et al. (2014)	Nunes et al. (2014)	Block et al. (2014)
Investor region																			
North America	X						X						X						X
South America																			
Europe				X					X	X	X	X		X	X	X		X	
Africa																			
Asia																			
Oceania			X		X	X		X											
Unknown																	X		

Tab. 6: Literature review: Investor type focus

	Wells (1974)	Poindexter (1976)	Tyebjee / Bruno (1981)	Tyebjee / Bruno (1984)	MacMillan et al. (1985)	Knight (1986)	MacMillan et al. (1987)	Khan (1987)	Sandberg et al. (1988)	Riquelme / Rickards (1992)	Carter / Van Auken (1992)	Hall / Hofer (1993)	Fried / Hisrich (1994)	Knight (1994)	Muzyka et al. (1996)	Bachher / Guild (1996)	Karsai et al. (1997)	Boocock / Woods (1997)	Zacharakis / Meyer (1998)
Investor type																			
VCF	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CVC																			
Family Offices																			
Accelerators																			
Private Equity Firms																			
Business Angels																X			
Mezzanine Funds																			
Debt investors (e.g., banks)																			
Unknown																			

	Feeney et al. (1999)	Shepherd / Zacharakis (1999)	Shepherd (1999a)	Bliss (1999)	Shepherd (1999b)	Shepherd et al. (2000)	Zacharakis / Shepherd (2001)	Shepherd et al. (2003)	Mason / Stark (2004)	Franke et al. (2004)	Silva (2004)	Franke et al. (2006)	Sudek (2007)	Franke et al. (2008)	Kollmann / Kuckertz (2010)	Petty / Gruber (2011)	Hsu et al. (2014)	Nunes et al. (2014)	Block et al. (2014)
Investor type																			
VCF			X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
CVC																			X
Family Offices																			
Accelerators																			
Private Equity Firms																			X
Business Angels	X								X				X				X		X
Mezzanine Funds																			
Debt investors (e.g., banks)									X										X
Unknown																			X

Tab. 7: Literature review: Research type and methodology

	Wells (1974)	Poindexter (1976)	Tyebjee / Bruno (1981)	Tyebjee / Bruno (1984)	MacMillan et al. (1985)	Knight (1986)	MacMillan et al. (1987)	Khan (1987)	Sandberg et al. (1988)	Riquelme / Rickards (1992)	Carter / Van Auken (1992)	Hall / Hofer (1993)	Fried / Hisrich (1994)	Knight (1994)	Muzyka et al. (1996)	Bachher / Guild (1996)	Karsai et al. (1997)	Boocock / Woods (1997)	Zacharakis / Meyer (1998)
Type of Research																			
Criteria Research	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Processual Research				X					X			X	X				X	X	X
Methodology																			
Interviews	X		X		X		X	X				X	X		X	X	X	X	
Questionnaires		X		X	X	X	X	X			X		X	X			X		
Archival Records Analysis																		X	
Verbal Protocols									X			X							
Experiments										X					X				X
Participant observations																			

	Feeney et al. (1999)	Shepherd / Zacharakis (1999)	Shepherd (1999a)	Bliss (1999)	Shepherd (1999b)	Shepherd et al. (2000)	Zacharakis / Shepherd (2001)	Shepherd et al. (2003)	Mason / Stark (2004)	Franke et al. (2004)	Silva (2004)	Franke et al. (2006)	Sudek (2007)	Franke et al. (2008)	Kollmann / Kuckertz (2010)	Petty / Gruber (2011)	Hsu et al. (2014)	Nunes et al. (2014)	Block et al. (2014)
Type of Research																			
Criteria Research	X		X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	(X)
Processual Research				X							X				X	X			
Methodology																			
Interviews	X			X							X					X			
Questionnaires			X	X	X	X				X	X	X	X	X	X		X	X	
Archival Records Analysis																X			X
Verbal Protocols									X										
Experiments			X		X	X	X			X		X		X			X		
Participant observations											X		X						

Tab. 8: Literature review: Stage focus

	Wells (1974)	Poindexter (1976)	Tyebjee / Bruno (1981)	Tyebjee / Bruno (1984)	MacMillan et al. (1985)	Knight (1986)	MacMillan et al. (1987)	Khan (1987)	Sandberg et al. (1988)	Riquelme / Rickards (1992)	Carter / Van Auken (1992)	Hall / Hofer (1993)	Fried / Hisrich (1994)	Knight (1994)	Muzyka et al. (1996)	Bachher / Guild (1996)	Karsai et al. (1997)	Boocock / Woods (1997)	Zacharakis / Meyer (1998)
Number of Investment Criteria				23	27	24 (40)	25	6	/	8	27	/	15	24 (46)	35	95	/	/	12
Company stage																			
Seed or Pre-Seed																X			
Startup / Early Stage	X	X	X		X	X	X	X		X						X			
Expansion / Growth / Late Stage																			
Maturity (LBO/MBO/IPO)																			
None in specific / general / mixed				X	X	X	X	X	X		X	X	X	X	X		X	X	X

	Feeney et al. (1999)	Shepherd / Zacharakis (1999)	Shepherd (1999a)	Bliss (1999)	Shepherd (1999b)	Shepherd et al. (2000)	Zacharakis / Shepherd (2001)	Shepherd et al. (2003)	Mason / Stark (2004)	Franke et al. (2004)	Silva (2004)	Franke et al. (2006)	Sudek (2007)	Franke et al. (2008)	Kollmann / Kuckertz (2010)	Petty / Gruber (2011)	Hsu et al. (2014)	Nunes et al. (2014)	Block et al. (2014)
Number of Investment Criteria	/		8	/	8	8			9 (31)	7	/	7	25	7	15	51	4		/
Company stage																			
Seed or Pre-Seed									X	X	X	X	X	X			X		X
Startup / Early Stage					X	X			X	X	X	X	X	X			X	X	X
Expansion / Growth / Late Stage																			X
Maturity (LBO/MBO/IPO)																			X
None in specific / general / mixed	X		X	X					X						X	X			

2.2.3 External influence on decision-making

In addition to the decision process and the decision criteria research another stream of research investigates the decision-making of VCs. Here, researchers investigate external influences on decision-making behavior. These external influences are structures or characteristics that are not an attribute of the venture, but an attribute of the decision-maker or the investment firm itself. One of the first studies is from Carter & Van Auken (1992), in which they find that VCs with and without a business background show differences in their decision-making. Following this initial study, Shepherd et al. (2003) investigate and compare the decision behavior of VCs with varying experience. Their study links experience with a performance measure for decision-making. Using conjoint analysis, they find that inexperienced investors increase their reliability and performance in decision-making with experience. However, they do not specifically analyze the effect of experience on the importance of various decision criteria. Franke et al. (2008) try to shed light on this question by evaluating the effect of investors' experience on the weight of the decision criteria used. They find evidence that experience can have an impact on decision-making. In their study of 51 VCs from Germany and Austria, they find that the experience of the decision-maker has a statistically significant influence on the evaluation of the educational background, leadership experience, and mutual acquaintance of the management team. They derive their results from cognitive research and argue that an individual's cognitive structures, also referred to as schemata, can explain the different importance assigned to the decision criteria.

Despite these two studies on the effect of experience, no other studies elaborate on this relationship or investigate others, such as the effect of entrepreneurial background on decision-making. This is particularly interesting, since many VCs are former entrepreneurs themselves. Drawing on cognitive research and cognitive schemata, one can argue that educational background or past performance might also influence the individuals' decision-making.

Moreover, the investment firms can influence the decision-making behavior. Past research shows that investors of various kinds differ in their goals, investment styles, and resource endowments (Elango et al., 1995). Past research often investigates the various investor types in isolation, and rarely analyzes investors and their decision-making in the same context. One of the first studies was by Bachher & Guild (1996), who assess the decision-making of business angels and VCs. They find differences in the importance associated with different decision criteria, but cannot root this in a theoretical framework. Both types of investors seem to put the

highest importance on the management team. More than 10 years later, Mason & Stark (2004) use verbal protocols to identify differences in decision-making between bankers, business angels, and VCs. They show differences, particularly regarding the financial and market aspects between the different investors. However, they also cannot root this in a particular theoretical framework. One of the most recent studies is by Hsu et al. (2014), who find that differences exist between VCs and business angels. In addition to these few studies, research focusing on decision-making behavior by investor type such as FOs, CVCs, or growth equity investors, remain absent. This is particularly striking as all of these investor types show significant differences in their governance structures, goals, and resource endowments.

Whereas VCs raise money from external limited partners, CVCs and FOs do not face this structure, as the capital provider is the corporation or the family behind the family office. Here, it can be hypothesized that VCFs need to accommodate many goals through their various and diverse limited partners, whereas CVCs and family offices do not face this challenge. Moreover, different agency perspectives exit among these various types of investors. Whereas growth equity funds or VCFs employ a management company (agent) to achieve the agreed upon goals, FOs sometimes do not poses this structure because the same organization provides the capital and manages the capital. Next to the different structured and potential agency aspects, investors also differ in their experience in investing. VCs have a long history, dating to one of the first VCF launched by Don Valentine (Sequoia Capital) in the 1970s (Karlgaard, 2005), compared to CVCs or FOs, which more recently moved increasingly into direct investments in entrepreneurial firms (Karger & Karger, 2016). Finally, it can be hypothesized that investors have different goals, resulting in different decision-making behavior. One goal of CVCs compared to VCFs or growth equity funds is to identify innovation and novel technology (Dushnitsky & Lenox, 2005). This strategic goal might translate into different decision-making behavior, in which CVCs put more importance on the product or technology of a venture rather than criteria related to financial returns. A similar argument might be true for FOs, since they also follow non-financial goals such as preserving a family's legacy and values, trusting relations between branches and generations, and family education (Wessel et al., 2014). The following table, table 9, summarizes the main finding from previous studies that have investigates external effects on the decision-making of VCs. As seen in this table and described above, in the context of decision-making of VCs, only a limited number of studies exist that focus on external effects on the decision-making.

Tab. 9: Literature review: External influence on decision-making

Study	Result
Individual level effects	
Carter & Van Auken (1992)	• Professional background (business or non-business) of the VC has an effect on decision-making. VCs with non-business background place greater importance on the uniqueness of the product, cost structure of the project and the entrepreneur's health.
Shepherd et al. (2003)	• VCs increase their reliability and performance in decision-making with experience.
Franke et al. (2008)	• Experience (in terms of length of being a VC) of the VC has a statistically significant influence on the evaluation of team characteristics that include educational background, leadership experience, and mutual acquaintance of the management team.
Investment firm level effects	
Bachher & Guild (1996)	• Business angels and VCs show different importance associated with various decision criteria.
Mason & Stark (2004)	• Bankers, business angels, and VCs attribute different importance towards financial and market aspects within their decision-making.
Hsu et al. (2014)	• VCs and business angels differ in the importance attributes to different decision criteria. Strategic readiness for funding and affective passion matter more to angel investors, while economic potential matters more to venture capitalists.

Source: Own illustration.

3 Qualitative analysis of decision criteria

This chapter aims to gain some first insights into and understanding of the decision-making behavior of VCs when assessing later-stage ventures. It helps to identify information signals that VCs use when screening later-stage ventures. Chapter 3 will outline the qualitative method I use to gain these first insights. Following the description of the method, I describe the data collected and present the results from 19 expert interviews. The chapter closes with a summary of the key decision criteria that private equity investors use when screening later-stage ventures to answer the first research questions (RQ1) of this dissertation.

3.1 Understanding decision-making in the context of later-stage ventures

This chapter looks at two key questions: First, what do the literature and secondary data indicate so far on the decision-making behavior of VCs in the case of later-stage ventures? Second, what information signals do VCs use based on primary data from market participants and their attributed importance? This combination of primary and secondary data can create an initial understanding to explain, describe, and interpret market participant decision behavior in the context of later-stage ventures (Glaser et al., 1968; Corbin & Strauss, 1994; Strauss et al., 1996; Glaser & Strauss, 2017). This explorative qualitative approach allows the study to transition from individual data observations to a more generalized picture of decision-making behavior.

Starting with the first question, two sources of information are available to answer this question. The first is information from the scientific literature, and the second is data from market participants. Starting with the scientific literature on decision behavior in the case of later-stage ventures, there is little information, Chapter 2.2 describes. Therefore, the current scientific literature does not provide enough information to identify the information signals that VCs use when they screen later-stage ventures, and therefore additional methods must be applied.

Next to investigating the literature, I can obtain additional information through secondary market data (Heaton, 2008). This can yield a better data triangulation (Eisenhardt, 1989; Yin, 2003). One way of gaining information on decision-making behavior in the context of later-stage ventures is to investigate investors that invest in these types of companies. One way

to obtain information is to evaluate data about these investors by using the investors' communication and marketing material. Though a potential bias can exist in this material, it can provide some initial insights.

Investors use different information materials to provide external stakeholders (e.g., later-stage ventures) with information about their investment criteria, investment strategy, team, and various other topics. Often this information appears on the investor's homepage. Looking at the homepages of 10 active VCs investing in this stage according to the amount of deals done in the 2 years since 2016, and 10 additional private equity investors identified via an unstructured search, yields some first clues. [16] First, I investigate a common section in an investor's homepage called "about us." In this section, investors present a description of their own firm, their goals, and perceptions of themselves. Table A1 (see appendix) summarizes these sections and the investor names. As the table highlights, many investors that invest in later-stage ventures associate their activities with various topics. Looking at the table, many investors express an interest in later-stage ventures that are growing fast or have significant growth opportunities. This is often linked to financial growth in the form of revenue, or to geographical growth in the form of internationalization. Profitability is also of interest for these investors, as they often express interest in ventures with a "path to profitability." Following growth and profitability, investors regularly state a "validated business model" or a "product with initial market traction" as a prerequisite for investing in a later-stage venture. Moreover, some investors articulate that they are looking for ambitious teams and entrepreneurs that are willing to grow the venture in national and international markets. Investors often mention this team and entrepreneur orientated point in the following way: "we invest in teams and people." In terms of industry preferences, some investors express a rather generalist approach, whereas others have a clear focus on a particular industry (e.g., software ventures). Furthermore, some investors state that they look for ventures that have an innovative service/product or are technology leaders. In addition to these venture-specific clues, I identify two others that are not direct characteristics of a venture on these websites. Some investors state that they prefer to be the first investor and others that they are interested in co-investing with existing investors. Lastly, some websites state that investors prefer to hold a minority equity stake in the venture, whereas others express interest

[16] The most active investors were selected via Pitchbook, a VC database, and via the criteria: greatest number of growth-stage deals from 2014-2016. The 10 additional private equity investors were identified using an unstructured search with the keywords "growth venture private equity investor" via Google Search.

in both minority and majority equity stakes, as well as in only majority stakes. All this information provides initial clues on the decision-making behavior of investors that invest in later-stage ventures. Summarizing these elements, it can be argued that investors present themselves as investment firms that focus on later-stage ventures with characteristics such as financial growth, internationalization potential, profitability, entrepreneurial team characteristics, an innovative product or service, and having existing investors. This self-image is different to that of early-stage investors, where investors imply that they invest in people and teams and do not emphasize the financial characteristics of a venture.

Next to investigating the self-images presented on websites, investors often specify their investment criteria more precisely and differentiate the types of companies in which they want to invest. This information is regularly accessible on the investor's homepage. This thesis therefore captures how investors differentiate the type of company they invest in (later-stage ventures) from other companies. Frequently, investors present their focus within a graphical illustration. Therefore, data were collected on these graphical illustrations with an unstructured search approach.[17]

As Figure A1 (see appendix) shows, many investors present their activities in investing in later-stage ventures between early-stage companies and mid-stage companies that are heading for exit. Sometimes, they present their activity such that it overlaps with early-stage companies. Additionally, the illustrations are in line with the "about us" sections from above. Next to the graphical illustrations, I investigate further data by looking at the specific investment criteria that investors mention regularly on their homepages. Based on an unstructured search, Table A2 (see appendix) represents the investment criteria stated on investors' homepages. Similar to the previous two secondary data analyses, I find similar investment criteria. Several investors are more specific about their investment criteria description than in the "about us" section. Financial figures are one example. Some investors give specifications in terms of revenue level (e.g., minimum of 2 million EUR revenue), profitability (e.g., EBITDA of at least 1 million EUR), or revenue growth rates (e.g., exceed 20% annual revenue growth rate). Others focus on investment criteria related to the team, such as ambition, industry experience, or leadership experience. Moreover, some investors address specific product aspects, such as technol-

[17] I identified the 10 additional VCs using an unstructured search with the keywords "growth venture private equity investor" via Google Picture Search.

ogy leadership, the product's value added, or intellectual property protected products or services. In addition, some mention further aspects such as addressable market size or potential international market leadership. However, these criteria remain nebulous and it is not possible to gain insights on the actual decision-making that investors employ in the context of later-stage ventures.

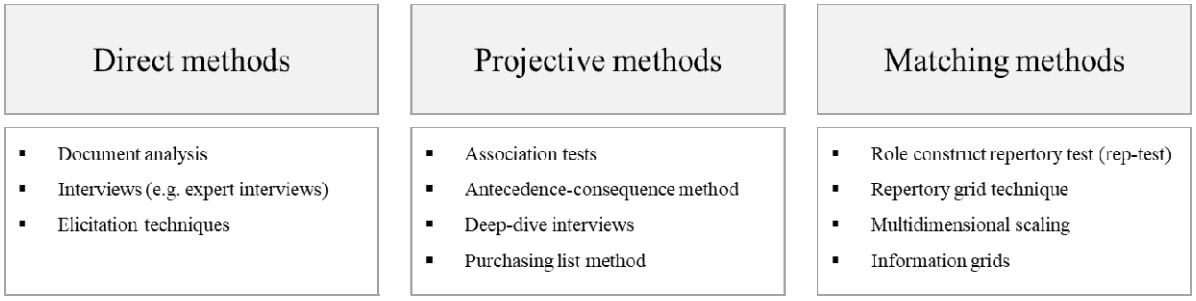
On combining the secondary data gathered above from all three sources, it can be seen that VCs seem to focus on growth characteristics (revenue or internationalization), profitability / cash flow characteristics (EBIT, EBITDA, and cash flow positive), team characteristics (ambition, entrepreneurs' experience in the industry, and track record), product / service characteristics (technology, intellectual property protection, and value-added or scalability), current investors (none, lead-investor), market characteristics (size or market and growth of the market), deal characteristics (minority stake, time horizon, instrument), business model characteristics (structure and design), and other generic characteristics (industry, location, or deal size) in their decision criteria.

However, information from past research and the insights from secondary data can only give limited information on investors' actual decision-making behavior in the case of later-stage ventures. Past research suffers from this research gap and cannot tell much about the decision policies that investors use for later-stage ventures. Moreover, secondary data lack real insights into investors' decision-making behavior and can only give hints and first clues. Thus, a more in-depth analysis is needed to identify the decision criteria that investors apply when screening later-stage ventures. Section 3.2 will describe the method to gather this additional information.

3.2 Method and sample

To gain deeper insights into the decision-making behavior and relevant decision criteria in the context of later-stage ventures, I apply several qualitative methodologies. Figure 6 summarizes the main methods that can be used to identify preference-relevant decision criteria.

Fig. 6: Methods to identify preference-relevant decision criteria



Source: Weiber & Mühlhaus, 2009.

This dissertation employs a combination of direct and projective methods to distill specific preference-relevant decision criteria. Direct methods represent techniques to identify relevant decision criteria directly. These criteria can be found in documents (see Section 3.1) or via interviews with experts in the field. I use both of these direct techniques to identify the decision criteria. As direct methods can suffer from several biases, such as only receiving trivial answers from interviews or only capturing what a participant can easily remember, I complement them with a projective method (Schubert, 1991). Projective methods are techniques to identify relevant decision criteria indirectly. For this dissertation, I chose association tests, in which participants receive a stimulus and researchers ask them to give a spontaneous response to the stimulus presented. Using this method, participants can imagine a more realistic scenario and therefore give more accurate information on their decision criteria (Weiber & Mühlhaus, 2009). Association tests also ensure an open expression of investors' views, which can be difficult to obtain when using only direct methods.

Within this dissertation, I combine the direct and projective methods by conducting interviews with 19 participants with an average length of 43 minutes (see Table 10). These 19 participants were selected via referrals from other scientists and VCs that are known to the author of this dissertation. This can introduce some selection bias in the gathered data, however the 19 participants represent experienced and well-known investment professionals in different countries that were not known to the author of this dissertation before. Statistical representativeness cannot be claimed, however giving the experience of the investment professionals and

diverse locations, a coverage various viewpoints can be expected that can provide some representativeness. The majority of the participants are male (approximately 90%). In terms of geographical and investor-type distribution, several different investors located in various countries took part to avoid biased results. Besides the 17 VCs, 2 fundraising consultants who regularly assists companies in fundraising and deal with investors frequently participated. The appendix (see Table A3) provides the interview guide with all questions and the association test. All interviews started with a general introduction to the topic, and I then presented a stimulus, for which the participants needed to envision a later-stage venture that approaches them for fundraising and then to think aloud about what they investigate when they see this venture for the first time. If participants express a certain criteria, I asked additional questions about why this criteria is relevant and how they evaluate it. If an interview partner fully expressed his or her view on a single criteria, I again asked about what other criteria they investigate. I did this until the participant did not think of any further criteria. In addition, I asked participants about the criteria that they did not mention, but that previous interviewees and the literature do mention. This approach mitigates the risk that the researcher's prior convictions bias the results (Gioia et al., 2013). Moreover, I asked participants in particular whether they see a difference in early-stage venture criteria compared to criteria for later-stage ventures, as these investors are also exposed to early-stage ventures in their professional investment activity. This way, I can address the research gap and provide hints on the expected differences in decision-making between both types of ventures.

Tab. 10: Interview sample characteristics

ID	Country	Type of company	Role	Gender	Date	Duration of interview
1	Luxembourg	Fundraising Consulting *Fundraising boutique*	Manager	Male	Nov. 2015	84 minutes 28 seconds
2	Luxembourg	Investor *Family office*	Partner	Male	Nov. 2015	62 minutes 21 seconds
3	Germany	Investor *VC*	Managing Partner	Male	Nov. 2015	45 minutes 47 seconds
4	USA	Fundraising Consulting *Fundraising boutique*	CEO	Male	Dec. 2015	37 minutes 25 seconds
5	Luxembourg	Investor *VC*	Founding Partner	Male	Dec. 2015	73 minutes 10 seconds
6	France	Investor *VC*	Partner	Male	Dec. 2015	31 minutes 07 seconds
7	UK	Investor *Growth equity fund*	Partner	Female	Jan. 2016	22 minutes 50 seconds
8	UK	Investor *CVC*	Partner	Male	Feb. 2016	33 minutes 45 seconds

9	Germany	Investor *VC*	Partner	Male	Jan. 2016	38 minutes 12 seconds
10	Italy	Investor *VC*	Managing Partner	Male	Dec. 2015	40 minutes 11 seconds
11	Germany	Investor *VC*	Partner	Male	Dec. 2015	42 minutes 32 seconds
12	USA	Investor *Growth equity fund*	Partner	Male	Dec. 2015	28 minutes 02 seconds
13	USA	Investor *VC*	Partner	Male	Feb. 2016	49 minutes 19 seconds
14	USA	Investor *Buyout fund*	Managing Director	Male	Dec. 2015	37 minutes 59 seconds
15	Germany	Investor *VC*	Founding Partner	Male	Feb. 2016	34 minutes 20 seconds
16	UK	Investor *VC*	Partner	Male	Mar. 2016	50 minutes 01 seconds
17	USA	Investor *VC*	Partner	Female	Mar. 2016	21 minutes 44 seconds
18	Canada	Investor *VC*	Managing Director	Male	Feb. 2016	61 minutes 27 seconds
19	France	Investor *Growth equity fund*	Partner	Male	May. 2016	41 minutes 35 seconds

Source: Own illustration.

All interviews were transcribed and then imported into QDA Miner, for quantitative analysis (Glaser & Strauss, 2017).[18] Following the transcription, I applied a coding schema to the interview data in order to identify relevant decision criteria and obtain an indication of the importance of these criteria. Initially, I developed a coding schema based on the past literature, document analysis (Section 3.1), and the initial interviews conducted prior to this dissertation. This coding schema was initially broad and only consisted of high-level criteria such as “team”, “product” or “market”. During the initial data analysis, I expanded the coding schema based on the findings to capture all relevant aspects of the decision-making process. This led to a very detailed coding schema that incorporated more details and many sub categories within the initial high-level criteria that were established. Later, I aggregated this detailed code schema to allow for a better comparison of the responses. Table A4 (see appendix) provides the coding schema. To test intracode-reliability, four of the transcribed interviews were again coded by myself after a period of 2 months (Ervin, 1964; Kondracki et al., 2002). This led to an intracode-reliability provided by QDA Miner of 0.90, indicating a good intracode-reliability. Intercode-reliability was not tested, which is a limitation of this dissertation.

[18] For 5 of the 19 interviews, I could transcribe only a summary of the interview because the participant did not agree to be recorded via an audio device.

3.3 Results: Interviews with VCs

3.3.1 Criteria to screen later-stage ventures

This section presents the results of the qualitative analysis of the transcribed interview data. In order to verify the assumed difference in decision criteria for early-stage ventures compared to later-stage ventures, Table 11 presents the respondents' answers to questions about whether they use and see different criteria for early- and later-stage ventures when screening them.

Tab. 11: Interviews - Early-stage vs. later-stage decision criteria

Question	Number of evidence (cases)	Quotes
Do you use and see different criteria between early-stage and later-stage ventures when you screen them?	Yes (17)	"Difficult question. But actually yes, there are just two different things. Early-stage is early-stage and growth stage is growth stage. You just have different things to look at. You cannot ask an early-stage venture on their revenue or profit, since they do not have any at all. It is really two different stories." [Interview No. 13]
		„Yes and no. Of course there are things that are the same. Of course that's about the people, but of course in a different perspective depending on the stage of investment. Depending on whether the founders are serial entrepreneurs, or really do something for the first time. Of course, what I cannot look at any numbers for early-stage companies. For later-stage ventures, you look at revenues, a little bit the KPIs. Seed investment lets you see if people have any idea of what you want to do, whether they're thinking about the following aspects: […] What does the customer bring in terms of revenues in the end? But of course the point of view is different between different stages of a company." [Interview No. 5]
		"Yes there are obvious differences. For example, in the seed or early-stage, I have absolutely no clue about numbers, growth or KPIs. So first of all, I have more and other information in the expansion-/growth-stage. So you cannot base your analysis for both stages on the same criteria. That does not make sense at all. And also the approach is different. In the seed stage, you really make a bet. […]So you can never judge both stages of companies the same way with the same criteria. That is really important to distinguish both." [Interview No. 6]
		"Yes, there are clear differences in criteria. That is also somehow a reason why you see such investors like us, who only focus on expansion-/growth-stage companies, compared to early-stage investors. You cannot use the same criteria for these two types of companies, especially as the two have different goals. Early-stage is betting on people to make a first product and really try to solve a technology risk, growth stage is about building companies and growing them. Completely different story." [Interview No. 7]
	No (2)	"Some things are already similar. In a few aspects sometimes look at other things, but actually I look at similar criteria. The focus remains the management team." [Interview No. 11]

Source: Own illustration based on interview data.

The answers are in line with the research gap described in Chapter 2 and provide the first evidence of the difference in criteria investors apply. The majority (17 out of 19) of participants give evidence that different criteria apply, indicating that VCs interpret other signals compared to early-stage ventures. First, later-stage ventures have information for a screening decision that early-stage ventures do not. This includes financial information such as revenue figures, revenue growth figures, margins, cash flow information, valuations, or profitability, which are limited or not available for early-stage ventures compared to later-stage ventures, according to the participants (Baum & Silverman, 2004). Even if this information is available for early-stage ventures, it has only little importance to investors since the quality of the information is limited. For example, one investor states:

> *"[…] Of course you sometimes have sales figures for early-stage ventures, but they do not really have a meaning as they are only available for one year […]"*
>
> *[Interview No. 16]*

In addition to financial information, early-stage ventures rarely have existing investors. This is very frequently the case for later-stage ventures according to the participants. Often, VCFs or business angels are already invested in a later-stage venture. Therefore, investors in a later-stage venture consider these new shareholders in a potential deal. Investors investigate the reputation, familiarity, and value they might bring to the venture. This quite illustrates these considerations:

> *"[…] We look at the current cap-table. What we are mainly interested in is to see who has already invested in the venture. Were they able to raise money from good investors or from unknown investors that nobody ever heard of? Since this is also a quality indicator for us, if you only raised money from somebody unknown in the ecosystem, that typically means all others have rejected you. Are we talking big guys like "investor name" with a huge reputation in the market or are we talking about an unknown investor, let it be a VC or an angel or a family office. […]."*
>
> *[Interview No. 13]*

Moreover, the business model for early-stage ventures is characterized by participants who are not often validated or even existing, whereas later-stage ventures already have a running business model in place. Besides these additional information signals that are present for later-stage ventures and not present for early-stage companies, there are other signals that are present for both early-stage and later-stage ventures, but are interpreted differently. One of these criteria is the management team. In the case of early-stage ventures, respondents regularly state that they look particularly at the team's ability to create a prototype that can be sold on the

market, whereas for later-stage ventures, investors look more often at the track record of the team and their ability to grow a venture. These differences can be seen in the following quote:

> *"You know in early-stage ventures, you basically need to arrive at a prototype of proof-of-concept. Sometimes, even if you only have IT developers in the team, that is completely fine for early-stage. But now everything is about growing the venture, so you need to have people that build sales teams, deal with financials, and build partnerships, and many other things. So you move from people that build a product to people that build a large company with that and new products."*
>
> *[Interview No. 4]*

All of this information provides the first evidence that investors use different decision criteria, and therefore different information signals, for later-stage ventures compared to early-stage companies. In addition to the first evidence of the difference in the criteria investors apply for later-stage ventures compared to early-stage ventures, I conducted a more in-depth qualitative analysis to identify specific decision-making criteria. Based on the qualitative interviews, I identified seven main categories of decision criteria based on the coding schema used: (1) management team characteristics, (2) financial characteristics, (3) market characteristics, (4) product characteristics, (5) international scalability characteristics, (6) business model characteristics, and (7) current investor characteristics. These have been categorized based on the previous categorization in the literature and based on qualitative analysis of the transcribed interviews, so that the main categories are as discrete as possible. Table 12 provides an overview of the coding and the seven main decision categories across all interviews.

Tab. 12: Main decision criteria categories for later-stage ventures

Categories	# Count	% Count	# Words	% Words
(1) Management team	85	16.22%	5,781	15.93%
(2) Financial	123	23.47%	6,639	18.30%
(3) Market	50	9.54%	3,485	9.61%
(4) Product	85	16.22%	5,821	16.05%
(5) International scalability	71	13.55%	6,443	17.76%
(6) Business model	69	13.17%	4,337	12.06%
(7) Current investors	41	7.82%	3,733	10.29%

Source: Own illustration based on interviews.

The second column (# count) in Table 12 represents the number of times this code and its subcodes (see appendix table A3) was used across all interviews, whereas the fourth column (# words) represents the number of words for which this code appears to indicate the importance of each category. As Table 12 shows, the most frequent decision criteria participants mentioned

fall into the financial, international scalability, and product characteristics categories. The least frequent criteria fall into market and current investor characteristics. The following paragraph elaborates more on the seven categories in detail.

The most frequently mentioned category associated with later-stage ventures are financial characteristics. Table 13 shows the main criteria interviewees mentioned in this category.

Tab. 13: Category - Financial characteristics

Category	# Count	% Count	# Words	% Words	# Interviews	% Interviews
Exit						
▪ Strategy and type	7	1,34%	335	0,92%	6	31,58%
▪ Easiness of exit	9	1,72%	517	1,43%	8	42,11%
Current and past financials						
▪ Revenue	29	5,53%	1,798	4,96%	19	100,00%
▪ Valuation	17	3,24%	628	1,73%	10	52,63%
▪ Growth	21	4,01%	1,445	3,98%	14	73,68%
▪ Margin	17	3,24%	804	2,22%	14	73,68%
▪ Profit	19	3,63%	1,001	2,76%	16	84,21%
▪ Cost	4	0,76%	111	0,31%	4	21,05%

Source: Own illustration based on interviews.

The financial characteristics in the context of this qualitative analysis include information about current and past financials, as well as a potential exit. Many investors stated that they put particular focus on revenue and its historic growth when they screen the venture for the first time. All 19 interviews stressed this as a relevant decision criteria and an important signal they investigate early in their screening process. In this context, growth is regularly referred to as a key objective of a new venture (Brush & Vanderwerf, 1992) that also correlates with the valuation of a new venture (Davila & Foster, 2005), which is a relevant measure for the investors' performance. Investors often see growth as a major indicator for future success and customer acceptance (Barringer et al., 2005), as the following statement shows:

> *I always look at the current revenue level and the historical growth, as this is a major indicator for future success. If your product is flying to customers like crazy, that is what I want and I want to see that in figures.*
>
> *[Interview No. 16]*

If a venture does not show significant revenue growth, investors often interpret it as a negative signal of problems with the product, market, or management team. This is in line with

previous research indicating a positive effect between management team experience and the financial performance of a new venture (Read et al., 2009). In some cases, investors even stated a threshold of 10% historical revenue growth as a minimum required threshold. A potential reason for this is the investor's required return on its investments over a rather short period. This requires that a fraction of the portfolio needs to have significant growth in order to reach the expected rate of return to its limited partners (Davila et al., 2003), and also exposes ventures to additional risk (e.g., additional managerial risk due to additional staff management; Fombrun & Wally, 1989). The valuation of a company is linked to sales growth. Often, investors calculate revenue-multiples directly in their minds to evaluate the feasibility of an investment during the screening process. If investors perceive that the valuation is too high, this can lead to a rejection of the venture, because it is often perceived as a sign of unrealistic expectations:

> *"It sends out a negative signal in terms of realistic expectations and also working together with the team later on. That is unfortunately happening quite often. If the sense of realism is already so far apart for the valuation, it will also often be the same for their strategy, internationalization, or recruitment decisions. This is really not a good sign."*
>
> *[Interview No. 4]*

Next to valuation, investors mentioned margins and profitability as a relevant decision criteria. As later-stage ventures are often on the market for a few years (Ruhnka & Young, 1987), margins and profitability have a closer evaluation. It is not a knock-out criteria to be unprofitable based on the interviews, but if this is the case, other figures, such as revenue growth, should indicate a potential reason. Some investors investigate what is called the structural profitability of the business, whereas they compare the cost of customer acquisition per customer to the revenue per customer:

> *"It is important that at the core, they are structurally profitable or profitable by the business model. This means that every new customer, subtracting all production cost, will result in a profit. Sometimes, of course, marketing costs are still sky high, but the key is that this business model is profitable, at least in the future."*
>
> *[Interview No. 7]*

Moreover, prior studies find that profitability is also linked to a firm's R&D activities, and innovative activities are positively associated with profitability (Czarnitzki & Kraft, 2011). Profitability can therefore be seen as a result of previous successful R&D activities:

> *"Mhm, if you have a product on the market and customer traction, I also look at EBIT or general profitability. I mean I want to see if they are on the path of profitability or if they still burn significant amounts of money. If the management team has already turned it into a profitably venture, after just 2-3 years, that is very interesting and valuable."*
>
> *[Interview No. 4]*

In addition to the venture's profitability, VCs pay attention to its achieved margins. Often, the stated margins are the profit-margin (often referred to as return on sales) or gross-margin. The ability of the venture to create a business that has above industry average gross-margin was seen as a relevant success factor. VCs often attributed this to an opportunity that the venture successfully exploited. Another criteria that investors considered consists of the various costs positions and their ratio to revenue. However, only a few participants mentioned this (4 participants), and therefore it can be considered a minor decision criteria in the screening process.

Besides the current and past financial characteristics, the interviewees frequently mentioned exit characteristics. Investors try to assess the ease as well as the type (e.g., trade-sale, IPO, or buyout) of exit that could happen in the future. This is seen as a relevant criteria, as the investment needs to provide an exit opportunity for the investors; otherwise, this is a knock-out criteria (Fried & Hisrich, 1994). However, only half of the respondents identified this as a relevant criteria within their screening process. It is therefore considered to be a minor criteria. This is similar to research on decision-making in early-stage ventures, where exit opportunities play a minor role in the screening and evaluation of the venture (Tyebjee & Bruno, 1984; MacMillan et al., 1985; Nunes et al., 2014). This might be due to the high uncertainty associated with the ease of exiting a company across different stages of development.

In case of financial characteristics, further evidence can be found regarding the different criteria used for early-stage ventures compared to later-stage ventures. So far, past research on VCs' decision-making in the context of early-stage ventures does not consider the current or past financial characteristics of a venture (e.g., Silva, 2004; Franke et al., 2008). Some studies include exit characteristics, but remain vague in the criteria specified (Sandberg et al., 1988; Nunes et al., 2014). Following the financial characteristics identified, the second most frequently used coding is associated with product characteristics, which include the information and features of the product or service that the venture is offering to customers. Table 14 provides an overview of all six criteria mentioned within this subcategory.

Tab. 14: Category - Product characteristics

Category	# Count	% Count	# Words	% Words	# Inter-views	% Inter-views
Product characteristics						
▪ Uniqueness	17	3,24%	766	2,11%	13	68,42%
▪ Intellectual property	14	2,67%	504	1,39%	10	52,63%
▪ Post-entry barriers	7	1,34%	537	1,48%	5	26,32%
▪ Value-add for customers	34	6,49%	3,187	8,78%	19	100,00%
▪ Quality of customers	4	0,76%	179	0,49%	2	10,53%
▪ Unit economy	3	0,57%	218	0,60%	3	15,79%

Source: Own illustration based on interviews.

The value-added that the product provides to clients is a relevant product aspect. Often, this is associated with the increase in utility that the product provides in the form of revenue growth or decreasing costs for B2B ventures or high user experience for B2C ventures. The following statement illustrates the value-added criteria:

> *"So then it is how much value their product creates, how difficult is it to replicate such a product, and if the first two are fine, then it is about how easily you can scale their business model. With replication, I do not necessarily mean patents and stuff like that, I also mean complex products or unique user experience. So yeah, the product is really key. To give you some figures maybe, if you have a product with which you can increase sales from a client by 30% or cut down costs by 70%, this is huge. You really need to have a product that can fundamentally change the current rules and mind-sets of the industry or customers. Yeah, so that is about that, it is really key."*
>
> *[Interview No. 13]*

This decision criteria was mentioned by all interviewees. It serves as a predictor for future customer's growth and the likelihood of an exit. Participants emphasized this decision criteria regularly in the context of changing current business conditions and disruptive products and services that can create significant value for clients (Christensen & Overdorf, 2000). About half of the participants mentioned assessing if the venture has intellectual property protection mechanisms, such as patents or trademarks, in place. Based on prior research, the presence of intellectual property protection is associated with higher start-up valuations, as they signal growth ambitions and the willingness to protect its marketing assets (Baum & Silverman, 2004; Busenitz et al., 2005; Mann & Sager, 2007; Jell et al., 2011; Audretsch et al., 2012; Block et al., 2014). However, many participants mentioned that this is not relevant for their screening

activity and they consider it only in a potential due diligence phase, as this is the stage at which they evaluate the value of the patent or trademark. The following statement illustrates this point:

> *"[…] Yes it is nice to have a patent or something else, but for the initial screening it is not more than just nice side information. You would need to be able to judge a patent in order to get some valuable information for your judgement, but at the screening stage this is impossible, except if you have too much time or are an expert in a very tiny field so that you can judge that in 2 minutes. This is only a criteria that is potentially looked at when due diligence would start."*
>
> *[Interview No. 14]*

Similar to studies focusing on early-stage ventures, participants emphasize the required uniqueness of the product or service that the company is offering (Tyebjee & Bruno, 1984; Mason & Stark, 2004). This way, ventures can differentiate themselves from competitors and offer a unique value proposition to clients. Product-related aspects are often one of the major reasons for rejecting a venture (Petty & Gruber, 2011). In addition to these three decision criteria, I identified three others, including the ability of the venture to create entry barriers with the product, the quality of customers, and the unit economy. Entry barriers include aspects such as customer switching costs, customer loyalty, or capital requirements to replicate the product (Karakaya, 2002). Investors identified this as a relevant decision criteria and a signal that the business can be easily rolled out across multiple customers, especially for B2B ventures. The last product related characteristic is unit economy, which refers to customers' lifetime value or acquisition costs. Here, VCs are looking for products with high lifetime values, meaning large amounts of sales to a single customer over the lifetime of the product. This is often industry-specific and evaluated over time.

The third most frequently coded category is associated with the management team characteristics. As the early research already indicates, investors that invest in new ventures put particular focus on the management team, as the majority of the risk is associated with the team (Franke et al., 2006; Franke et al., 2008; Petty & Gruber, 2011; Hsu et al., 2014).[19] In the interviews, two subcategories were identified: the decision criteria related to the founder itself and the criteria related to the management team as a whole. As later-stage ventures already employ

[19] MacMillan et al. (1985) illustrate the importance of entrepreneurs to a venture capital investor with the following quote: *"There is no question that irrespective of the horse (product), horse race (market), or odds (financial criteria), it is the jockey (entrepreneur) who fundamentally determines whether the venture capitalist will place a bet at all." (MacMillan et al., 1985, pp. 119).*

multiple employees, the management team can consist of founders and non-founders. Table 15 shows an overview of all criteria mentioned within this subcategory.

Tab. 15: Category - Management team characteristics

Category	# Count	% Count	# Words	% Words	# Interviews	% Interviews
Entrepreneur / Founder						
▪ Industry experience	4	0,76%	100	0,28%	4	21,05%
▪ Education	6	1,15%	341	0,94%	6	31,58%
▪ Personality	7	1,34%	847	2,33%	7	36,84%
▪ Track record	3	0,57%	213	0,59%	2	10,53%
Management team						
▪ Growth experience	8	1,53%	439	1,21%	7	36,84%
▪ Size of team	2	0,38%	170	0,47%	2	10,53%
▪ Composition of team	17	3,24%	1,070	2,95%	10	52,63%
▪ Type of previous company	5	0,95%	496	1,37%	4	21,05%
▪ Track record team	33	6,30%	2,105	5,80%	16	84,21%

Source: Own illustration based on interviews.

According to the data, market participants are convinced that the track records of the management team strongly influence their screening decision (cited by 84% of the participants). Track records include successful past exits with previous companies, relevant prior industry experience, and relevant past leadership experience. Particularly, investors were looking for a serial entrepreneurial team that created successful companies in the past. Some VCs indicated that they look for balanced skills between all management team members, with some team members being more technical and other having more skills for managing a company. VCs view these complementary competencies positively on the basis of empirical research (Franke et al., 2006).

> *"Typically, ventures are confronted with thousands of different tasks at that stage and the team needs to tackle these challenges with different skills. You know in early-stage ventures, you basically need to arrive at a prototype of proof-of-concept. Sometimes, even if you only have IT developers in the team, that is completely fine for early-stage. But now everything is about growing the venture, so you need to have people that build sales teams, deal with financials, and build partnerships and many other things. So you move from people that build a product to people that build a large company with that and new products."*
>
> *[Interview No. 18]*

Some VCs (36.84%) mentioned that they investigate particular growth experience in the past, and whether enough team members had experience growing a venture because this is the later-stage venture's primary goal from their point of view. The size of the team plays only a minor role in the screening process. Additionally, the interviewees rarely mentioned the type of company for which the team previously worked. This criteria represents whether team members worked in both small companies and large international corporations, or have even been investors themselves in the past. They placed only minor focus on the individuals in the team. Investors view the dynamic of the entire team and its composition as more relevant. The personality of the founder(s) only plays a role in the due diligence process due to the long term commitment over many years. The favored personality traits include the ability to sustain intense efforts, evaluate and react to risk, honesty and integrity, and being open to suggestions and criticism (Knight, 1986; Bachher & Guild, 1996). These traits can be assessed only during personal meetings and not from teasers or business plans from companies. Moreover, investors do not perceive educational background as a relevant decision criteria in the screening.

> *"Sure, but it is not that easy. I need to trust the people I invest in. So I try to see how honest a person is. If he is not honest in a meeting with me, why should he if money flows into his company. Next to honesty, they need to work like crazy. Passion and ambition are super important. They will go through hard times over a long period with their company, if I see that they cannot sustain this efforts and pain, it is difficult to go further. I would say these two things are important to me."*
>
> *[Interview No. 11]*

Following the management team, investors focus on the international scalability of the business, which refers to the ability of the business to scale internationally into new geographical markets. This category combines both internationalization of companies in new geographical areas as well as the easiness of scaling / growing these ventures. Often these two aspects can occur together. In practice, growing a venture often results in using internationalization as a mean to do so and to position a venture in a new market. Growing rapidly into global markets can benefit both the founders as well as potential investors (Bailetti, 2012), as it can increase a venture's adaptability to uncertain conditions and its willingness to adapt and change (Sapienza et al., 2006). Through scaling a venture internationally, stakeholder can profit from higher valuations and more diversified revenue sources. However, entering international markets also exposes a later-stage venture to new risk in the form of liability of newness or the liability of foreignness (Zaheer, 1995; Lu & Beamish, 2001; Johanson & Vahlne, 2009). This is also a

difference in the decision-making criteria between early-stage and growth-stage ventures because early-stage ventures rarely focus on international expansion before creating the first product. Often, only 20% of young firms have international sales after their first year and take 4 years after receiving the first foreign sales on average (Autio et al., 2000). Table 16 shows an overview of all criteria mentioned within this subcategory.

Tab. 16: Category - International scalability characteristics

Category	# Count	% Count	# Words	% Words	# Interviews	% Interviews
International scalability characteristics						
▪ Costs of scaling	31	5,92%	2,683	7,40%	16	84,21%
▪ Time	18	3,44%	1,541	4,25%	12	63,16%
▪ Strategy	11	2,10%	1,312	3,62%	10	52,63%
▪ Experience in foreign markets	7	1,34%	616	1,70%	6	31,58%
▪ Foreign network	4	0,76%	291	0,80%	4	21,05%

Source: Own illustration based on interviews.

Investors focus on the cost and time needed to scale the venture internationally in particular. They perceive this as a key goal for later-stage ventures. Particularly relevant is the ease of scaling the venture. Investors focus on businesses that can easily be replicated in another international market. Investors are interested in ventures that can quickly scale into new markets. They are aware of potential competition in other markets and therefore favor ventures that do not require much time to enter these markets. Moreover, investors mentioned the investment required to scale into new markets. If a venture requires significant investment in the form of new infrastructure or need to apply for specific licenses to operate in the new market, they view this as a relevant aspect to evaluate.

> "*The most important thing for me is the scalability of the business model really. Do they have to start from scratch if they go to country X or do they just need to adapt the product slightly for the new market?"*
>
> *[Interview No. 6]*

> *"Mhm, I would say the scalability of the whole model. For us as investors, it is important that we manage to return the money to our investors at least twice. For that we need just a few top exits in the portfolio. And it is important to have a "Unicorn" in your portfolio, you just need a company, which manages to return the entire fund at once. And that essentially means one thing. Companies that are easy to scale, especially in other international markets."*
>
> *[Interview No. 9]*

Investors attributed minor relevance on criteria that include the strategy to scale to international markets, experience in foreign markets, and potential foreign networks within the management team (all cited by less than 52% of all participants).

Another frequently criteria within the screening process is the business model. The business model here refers to the structure, governance, and functioning of the business to generate profit while exploiting a business opportunity (Amit & Zott, 2001; Zott & Amit, 2010). The past research on decision criteria has largely ignored this decision criteria (see overview in Nunes et al., 2014), probably due to the focus on early-stage ventures that are still experimenting with their business model. In the case of later-stage ventures, VCs cited the criteria in Table 17.

Tab. 17: Business model characteristics

Category	# Count	% Count	# Words	% Words	# Interviews	% Interviews
Business model characteristics						
▪ Design & structure	31	5,92%	2,683	7,40%	16	84,21%
▪ Revenue generation	18	3,44%	1,541	4,25%	12	63,16%
▪ Risks	11	2,10%	1,312	3,62%	10	52,63%
▪ Flexibility	7	1,34%	616	1,70%	6	31,58%
▪ Industry KPIs	4	0,76%	291	0,80%	4	21,05%

Source: Own illustration based on interviews.

Within the initial screening, VCs investigate mostly the design and structure of the business model that the teaser or business plan describes. They investigate the business model structure (84% of participants), such as whether it is structured around the user-experience or around a particular technology. This is mainly to assess the difficulty for competitors to replicate a business model. This decision criteria is a further distinctive difference compared to early-stage ventures, which do not have a validated business model, or even any business model.

"Mhm, let me think. I would say the entire model. I mean business model. I need to understand how they work; is it a marketplace, where money making is determent by a critical mass of people and a structure to keep these people from going to other players. Or is it designed around a technology. How does the revenue model work; is it license-based or value-pricing? I really try to assess the functionality of the business model. I do not really like models that are just running around the cost. I mean cost-leadership is an old concept, but many ventures still follow this. But I really do not like ventures that just exist to produce a mass product cheap; it is not as nice to scale as other models are."

[Interview No. 4]

Next to the structure and design of the business model, investors stated that they also investigate the specific risk that can be present in the business model. Risk here refers to characteristics of the business model such as only relying on one key technology that is associated with high uncertainty and volatility or relying on one partnership, such as a key supplier.

"And one last point, [...] if there is a "single point of failure" then we would not go in there either. A single point of failure may e.g. a company that is active on the internet and is financed by advertising [...]. and when the company gets 90% of the traffic from Google, and then Google changes its algorithm and suddenly comes down to 10%, so if Google's dependency is too big."

[Interview No. 3]

VCs also mentioned the flexibility of the business model to maintain the ability to adapt it, specific industry KPIs such as conversion rates or size of shopping basket, and how the business generates revenue through the business model. However, they assign the biggest importance to the structure of the business model. Market characteristics are another category of decision criteria applied in the context of later-stage ventures. Market characteristics are criteria that relate to external market conditions that the later-stage venture cannot influence.

Tab. 18: Category - Market characteristics

Category	# Count	% Count	# Words	% Words	# Interviews	% Interviews
Market characteristics						
▪ Competition	12	2,29%	654	1,80%	8	42,11%
▪ Market size	16	3,05%	946	2,61%	11	57,89%
▪ Market growth	4	0,76%	62	0,17%	4	21,05%
▪ Legal and governmental constrains	7	1,34%	473	1,30%	6	31,58%
▪ Scope (narrow or broad)	5	0,95%	647	1,78%	4	21,05%
▪ Suppliers and distributors	1	0,19%	25	0,07%	1	5,26%
▪ Timing of entry	1	0,19%	145	0,40%	1	5,26%

▪ Access to market	4	0,76%	533	1,47%	4	21,05%

Source: Own illustration based on interviews.

Table 18 summarizes all criteria mentioned during the interviews in this category. One of the major criteria is competition in the venture's market (cited by 42% of participants). Investor stated a clear preference for markets with relatively low levels of competition. However, investors pointed out this not to be a major criteria in their screening decision. In addition, similar to early stage research, investors stated that they look at the potential market size of the venture to assess exit potential (Tyebjee & Bruno, 1981; Tyebjee & Bruno, 1984; Sudek, 2007).

> *"I would say market potential. Is it really a big market they want to tackle and how is this market growing. From experience it is very important to focus on ventures where I could see a big market ahead of them. You know we need +10x returns on our investments. So small markets will not keep us performing."*
>
> *[Interview No. 7]*

Besides market size, market growth, and competition, investors cited criteria related to legal constraints, market scope, entry timing, and access to the market. However, VCs rarely cited these criteria in the decision process in the context of later-stage ventures. The last category consists of criteria about existing shareholders, meaning other investors. In screening later-stage ventures, investors put particular focus on this aspect. Table 19 shows the four identified criteria within this category.

Tab. 19: Category - Current investor characteristics

Category	# Count	% Count	# Words	% Words	# Interviews	% Interviews
Current investor characteristics						
▪ Reputation	16	3,05%	1,334	3,68%	14	73,68%
▪ Familiarity	13	2,48%	1,091	3,01%	12	63,16%
▪ Type of investor	10	1,91%	828	2,28%	10	52,63%
▪ Network	2	0,38%	480	1,32%	2	10,53%

Source: Own illustration based on interviews.

As Table 19 shows, the majority of VCs focus on the reputation and familiarity of existing investors (73% of participants). Some put particular focus on reputation, since they state that this helps the portfolio company, and therefore their potential investment, to achieve higher returns. Prior studies show that venture capital investors with higher reputation can increase the likelihood of positive exits in the form of IPOs (Nahata, 2008; Krishnan et al., 2011). They see

an existing reputable investor as a positive sign of the quality of the later-stage venture. Further, investors stated that the more familiar they are with the existing investor, the better it is, as they will potentially share a long-term relationship. Divergent goals can exist in an investment in some cases, and some investors might exploit other investors.

> *"We look at the current cap-table. What we are mainly interested in is to see who has already invested in the venture. Were they able to raise money from good investors or from unknown investors that nobody ever heard of. Since this is also a quality indicator for us, if you only raised money from somebody unknown in the ecosystem, that typically means that all others rejected you. Are we talking big guys, like "investor name" with a huge reputation in the market or are we talking about an unknown investor, let it be a VC or an angel or a family office. This is also a difference, since you need to assess it based on your own investment vehicle. Like us, we like big investors with good reputations, since we believe that they can contribute a significant portion of the value in the venture. Of course, big players are not without risk, but we believe on the upside."*
>
> *[Interview No. 13]*

In addition, the type of investor plays an important role in the screening. Some favor institutional investors such as private equity funds; other favor a diverse base of investors (e.g., a mix of business angels and VCFs). Some argued that this is a relevant criteria, as diverse sets of interests need to be managed. A small set of respondents stated that they also evaluate the network that existing investors have to further support the venture in client introductions or follow-on fundraising.

Besides the identified decision criteria, investors discussed the duration of their decision process and the criteria that are only relevant in the screening process. On average, participants stated that they have a rather quick screening process. Investment opportunities are initially screened generically on industry, stage, and geography. Following this, the actual screening activity takes up to 10 minutes. This is in line with previous research on the decision-making processes of VCs, which show longer assessment durations for later-stage companies than for early-stage ventures (Hall & Hofer, 1993). The following statement illustrates this point:

> *"Maximum would be 10 minutes, I would say. Not really more than that. It needs to be quick, otherwise I waste my time."*
>
> *[Interview No. 13]*

The analysis above answers the first research question by giving evidence on what decision criteria investors use in the context of later-stage venture screening. The information

signals are divided into seven main categories: (1) management team characteristics, (2) financial characteristics, (3) market characteristics, (4) product characteristics, (5) international scalability characteristics, (6) business model characteristics, and (7) current investor characteristics. Within these categories, investors expressed several decision criteria that either increase the expected return or reduce the perceived risk of a potential deal from their point of view. These results contribute to the entrepreneurial finance literature, by providing a new set of criteria that investor are using when screening later-stage ventures that is different to the criteria used in the context of early-stage ventures. New criteria in the context of later-stage ventures, which have not been identified or used in past, are financial characteristics (e.g. revenue growth, margins or profitability), business model characteristics (e.g. design or flexibility), current investor characteristics (e.g. reputation or familiarity), and internationalization characteristics (e.g. cost or time to internationalize). Product related (e.g. uniqueness of the product or the availability of a prototype), team related criteria (e.g. industry experience or education), and market related characteristics (e.g. size of the market) are also used in previous research in the context of early-stage ventures, however have different operationalization when being assessed in the context of later-stage ventures. For example, research focusing on early-stage ventures, industry experience is deemed to be one of the most important criteria of the management team in order to increase the chances to establish an initial product or service. Whereas for later-stage ventures, the track record of the teams seems to play the most important role in order to provide investors with comfort on the management team quality to grow a company rather than build an initial product.

3.3.2 Importance of specific decision criteria

Despite the various decision criteria that investors state, it remains unclear what importance investors attribute to each, and if trade-offs exist. However, prior research shows that investors simultaneously use a limited set of decision criteria in their decision process and do not rely on a "laundry list" of a large number of decision criteria (Bachher & Guild, 1996; Muzyka et al., 1996; Shepherd et al., 2000; Sharma, 2015).

Tab. 20: Importance of the stated decision criteria in interviews

Criteria	Category	% Count	% Words	% Interviews
(1) Revenue	Financial characteristics	5,53%	4,96%	100,00%
(2) Value add for customers	Product characteristics	6,49%	8,78%	100,00%
(3) Design	Business model characteristics	5,92%	5,68%	94,74%

(4) Track record team	Management team characteristics	6,30%	5,80%	84,21%
(5) Profit	Financial characteristics	3,63%	2,76%	84,21%
(6) Costs	International scalability characteristics	5,92%	7,40%	84,21%
(7) Growth	Financial characteristics	4,01%	3,98%	73,68%
(8) Margin	Financial characteristics	3,24%	2,22%	73,68%
(9) Reputation	Current investor characteristics	3,05%	3,68%	73,68%
(10) Uniqueness	Product characteristics	3,24%	2,11%	68,42%
(11) Time	International scalability characteristics	3,44%	4,25%	63,16%
(12) Familiarity	Current investor characteristics	2,48%	3,01%	63,16%
(13) Market size	Market characteristics	3,05%	2,61%	57,89%
(14) Industry KPIs	Business model characteristics	3,05%	2,16%	57,89%
(15) Composition of team	Management team characteristics	3,24%	2,95%	52,63%
(16) Valuation	Financial characteristics	3,24%	1,73%	52,63%
(17) Intellectual property	Product characteristics	2,67%	1,39%	52,63%
(18) Strategy	International scalability characteristics	2,10%	3,62%	52,63%
(19) Type of investor	Current investor characteristics	1,91%	2,28%	52,63%

Source: Own illustration based on interviews.

To determine the most relevant decision criteria, I draw on the information gained in the interviews. To distil the most relevant decision criteria, I investigate the frequencies that investors mention specific criteria, and conduct a further in-depth analysis of the transcribed data and engage in additional discussion with researchers. Table 20 shows the most frequently identified criteria that more than 50% of the participants mentioned (including word and coding frequencies).[20]

The data in Table 20 show that, in the screening process, investors place particular focus on the venture's historical revenue as a measure for higher expected returns (mentioned by all participants). Participants often refer to this criteria as the most relevant indicator for the venture's future success. Investors often use this in conjunction with revenue growth and typically examine it first. This is in contrast to research on decision criteria used in the case of early-stage venture, that mainly focus on team characteristics (Franke et al., 2008, Nunes et al., 2014).

Following the financial criteria, investors place high importance on the value-added that the product or service creates. While understanding the product, VCs assess the magnitude of the impact the product can have and how innovative it is. Again, all participants stated this decision criteria in the context of later-stage ventures, but in the context of early-stage ventures

[20] In addition, investors mentioned that they often do not use more than eight decision criteria in their judgment, as otherwise, the screening takes too much time and the amount of information otherwise overwhelms them.

it has been operationalized differently in past research (Manson & Stark, 2002; Kollmann & Kuckertz, 2010). Here research mainly identified criteria that addressed the uniqueness or patentability of a product, but not its impact like in the context of later-stage ventures.

After these two decision criteria, VCs named the business model and management team as important decision criteria (both stated by more than 84% of participants). This is in contrast to research focusing on early-stage ventures showing that investors place the highest importance on the management team and have so far not identified or used this criteria (Franke et al., 2006; Franke et al., 2008). VCs indicated that track records play an important role, as later-stage ventures have different challenges compared with early-stage ventures. In contrast to early-stage research, profitability plays an important role in the context of later-stage venture screening. Based on the data, 84% of participants indicated that they use this as a criteria in their screening process. This is linked with the decision criteria focusing on the margin of the venture, and investors see it as a major proof of success of the venture's innovation. Besides financial characteristics, VCs mentioned international scalability as a highly important criteria across all decision criteria. Investors often mentioned investment/cost and time in conjunction. VCs pointed out that this can have a significant influence on their expected return. In addition, the current capitalization table played a considerable role across all criteria, in contrast to early-stage ventures, where often no institutional investor exist yet and therefore this criteria cannot be found in existing literature for early-stage ventures. Particularly, investors mentioned the influence that existing external investors can have on the entrepreneurs' goals.

Many other criteria played an important role, including the uniqueness of the product or the assumed market size of the later-stage venture. However, in many cases, VCs stated that they mainly investigate this criteria when it comes to a first meeting or due diligence. VCs mentioned this in particular with regard to intellectual property protection, valuation, internationalization strategy, and the team composition. They argued that in the initial screening, it is not possible to assess these criteria properly in time, and they therefore do not serve as major criteria. Moreover, several investors stated that they only rely on up to eight criteria; otherwise, it would take too much time to screen and create a process that is too complicated to process a larger number of criteria in a short time. In summary, the data demonstrate that investors rely on different criteria for later-stage venture screening compared to early-stage screening. Moreover, this study identifies and describes the seven most frequently used decision criteria.

4 Method: Measuring decision behavior with conjoint designs

4.1 Method and operationalization

The previous chapter identified decision criteria, which VCs use when making a screening decision on a later-stage venture. However, it is still not clear how these information affect investors' actual decision-making in reality. It is important to understand how these various information interact to clarify investors' decision-making, identify trade-offs, understand the relative importance of different signals, and possibly improve investors' decisions. Therefore, in this method chapter, I describe method to further measure decision-making behavior in the context of later-stage ventures, elaborate upon its advantages over other methods, and define the design chosen to model real-time decision-making. Moreover, I explain its realization further.

4.1.1 Conjoint analysis vs. other methods

An important question to be answered within this dissertation is which method is the most appropriate for answering questions RQ2-RQ5. Decision criteria research uses many methods to get a better understanding of decision-making. Table 7 (see Chapter 2.2.2) provides an overview of the methods used for decision criteria research since the first studies by Pointexter in the 1970s. As Table 7 (see Chapter 2.2.2) shows, the most frequently employed methods when analyzing VCs' decision-making are questionnaires and interviews. The majority of the studies that rely on this method implement questionnaires and interviews such that they ask investors to rate multiple items on a Likert scale to indicate the importance they attribute to a single decision criteria, one after the other. Studies relying on the method often conclude that certain criteria are more important than others are or try to identify specific knock-out criteria. These studies provide the first deeper insights into investors' decision-making behavior and the importance of various information signals. Nevertheless, these insights suffer from several limitations and biases due to the method. Hall & Hofer (1993) were among the first to employ real-time investigation methods compared to the post-hoc questionnaires or interviews that previous studies use. They show that in contrast to all previous studies, real-time investigation methods yield different results. For example, studies that use questionnaires or interviews show that investor put the highest importance on the team's characteristics or the characteristics of the founder / entrepreneur. In contrast to these results, the real-time investigation by Hall & Hofer

(1997) shows that VCs pay relatively little attention to this criteria and focus on other aspects of the venture.

As Shepherd & Zacharakis (1999) point out, questionnaires and interviews that aim to analyze decision-making behavior rely on self-reported decision behavior from past decisions. In this context, past research in various fields shows that relying on this post-hoc and self-reported information is very likely to yield biased results (Huber & Power, 1985; Golden, 1992; Zacharakis & Meyer, 1998; Elgar et al., 2005; Shachar & Eckstein, 2007). There are three main reasons for these biased results. One has roots in participants' recall bias (Van den Brink et al., 2001). Recall bias is present when participants cannot correctly recall, due to cognitive limitations, circumstances in the past or attribute significantly higher or lower importance to specific circumstances. Applying this risk to the research question of this dissertation, asking investors about their decision-making behavior may also suffer from investors' inability to recall the correct decision-making. Some refer to this bias as post-hoc bias.

The second issue relates to self-reporting bias. As in many studies, investors are asked to state their decision policy via several question items. This method can lead to a self-reporting bias, which occurs when research participants respond in a way that makes them look good compared to others. Regularly, they under-report aspects that could be considered inappropriate and over-report aspects that others see as appropriate. This leads to a tendency to answer and respond in professionally or socially desirable ways, and to not give a correct representation of real life. This bias exists in various domains, especially when using questionnaires or interviews (Moorman & Podsakoff, 1992; Donaldson & Grant-Vallone, 2002; Elgar et al., 2005).

The last methodological problem relates to the separate measurement of items in a questionnaire or interview. Especially in decision scenarios, studies indicate that participants show a "tendency to the top" (MacMillan et al., 1985) if decision criteria are measured separately. For example, in the case of product selection using a questionnaire, participants often rate each criteria presented as very important to them, even though other studies show that their actual decision-making can hardly be predicted with these measures. This often leads to results that can be summarized as "nearly everything is important to participants." This univariate approach leads to this bias, which is why some studies argue for the use of multivariate approaches that measure decision criteria and participants' behavior conjointly. This makes the decision scenario more realistic to participants and enables researchers to measure multiple criteria and their interactions simultaneously (often also called "CONsiedered JOINTly" characteristics) (Lohrke et al., 2010; Backhaus et al., 2015).

Because of the limitation of questionnaires and interviews, as well as this study's research questions, I use real-time conjoint analysis, as prior research in this field suggests. This makes it possible to measure decision criteria conjointly and allows for an accurate representation of private equity investors' decision behavior. This follows in line with studies in this field that also implement conjoint analysis (Riquelme & Rickards, 1992; Muzyka et al., 1996; Shepherd & Zacharakis, 1999; Shepherd, 1999a; Shepherd, 1999b; Shepherd et al., 2000; Franke et al., 2006; Franke et al., 2008; Hsu et al., 2014).

Another frequently used real-time method in the field of the decision-making research into private equity investors is "verbal protocols." Verbal protocols are transcripts of individual thought processes. In this method, participants are asked to describe his / her decision-making approach based on a particular presented case and to "think aloud" on everything that is in his or her mind. The described decision process is then recorded directly by the researcher or with the help of a recording device. The recorded decision process is then transcribed and analyzed via a coding schema (Nisbett & Wilson, 1977; Sandberg et al., 1988; Someren et al., 1994). There have been a few studies using this method in a context similar to that of this dissertation (Sandberg et al., 1988; Hall & Hofer, 1993; Zacharakis & Meyer, 1995; Mason & Stark, 2004).

While it allows for an in-depth analysis of the decision-making process and overcomes some limitations of surveys, this method is not without limitations. Because of the intense effort to undertake such a study, only a very few participants can participate. Sandberg et al. (1988) use one individual as the basis of analysis, whereas Hall & Hofer look at four individuals. More recent studies, such as Mason & Stark (2004) and Carter et al. (2007), use data from 10 to 35 individuals. This leads to a problem with the external validity of the results from a verbal protocol analysis. While it minimizes recall and post-hoc rationalization biases and offers new insights into the decision-making process and criteria, this method has additional limitations. First, this method is subject to the researcher's subjectivity in the coding, interpretation, and analysis of the transcribed thought process (Riquelme & Rickards, 1992). Next, the measure of "thought units" in a verbal protocol can be seen as an imperfect measure of the importance of a decision criteria. The criteria respondents mention most frequently are not necessarily the ones with the biggest influence on the individual's decision behavior. Even the contrary can be the case. Participants may repeat a certain criteria several times, if the participant is not certain about the importance of the criteria. Moreover, the artificial situation that respondents confront ("thinking aloud") is unusual in their daily business and may be uncomfortable for the participant, resulting in a biased representation of their thinking and decision behavior. Lastly, verbal

protocols cannot provide an adequate ability to compare the relative importance of various decision criteria (Zacharakis & Meyer, 1995; Shepherd & Zacharakis, 1999; Zacharakis & Shepherd, 2007; Smith et al., 2010). These reasons suggest that conjoint analysis is the appropriate method to analyze the decision-making behavior of private equity investors in the context of this study.

In addition to surveys and verbal protocols, a few studies use archival records analysis in the context of private equity investors' decision behavior (Boocock & Woods, 1997). The approach in this method is to collect archival documents from participants and several sources (e.g., meeting minutes, email conversations, or interviews) and then to identify patterns across all of these documents. Researchers to this regularly with only one participant to derive propositions for testing in further research. Archival document analysis has very similar limitations to verbal protocols, and I therefore did not choose this method in the context of this thesis. Based on the advantages of conjoint analysis described in regards to the research questions and the limitations of other methods, I chose an experimental conjoint analysis for this dissertation as the most appropriate method.

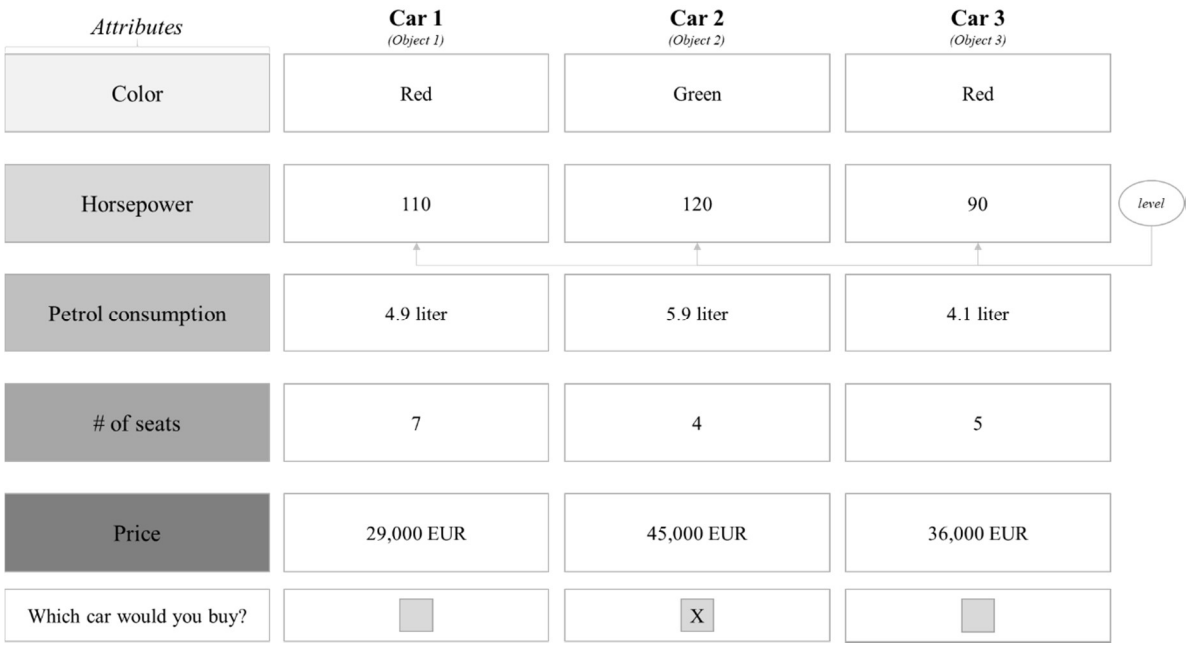
However, conjoint approaches also come with limitations. Conjoint studies often rely on a hypothetical context and is therefore lacking actual real life consequences of the decisions made. This questions to what degree data from conjoint studies can describe "true" preferences (Lohrke et al., 2010). In order to mitigate such a risk, researchers have suggested to use incentive-aligned approaches, to confront participants with real life consequences of their decision (Ding et al., 2005).

4.1.2 Conjoint method – choice based conjoint

Even though conjoint methodology offers an appropriate technique to get insights into decision-making behavior of individuals, there are many different types of conjoint analysis and different aspects to consider when applying conjoint methods. The idea and underlying concept of conjoint analysis was first introduced by Luce & Tukey in the 1960s (Luce & Tukey, 1964). Conjoint analysis are multivariate methods to evaluate preference structures of individuals (Lohrke et al., 2010; Orme, 2010; Backhaus et al., 2015; Backhaus et al., 2016). The key component of conjoint analysis are so called "objects". An object (e.g. a car) consists out of several "attributes" (e.g. color of the car, horsepower, petrol consumption, and many others) and multiple objects (e.g. various cars) are evaluated / rated by individuals to indirectly describe and measure their decision-making and preference structure. The various objects (different cars)

are described with the same attributes (e.g. color of the car, horsepower, petrol consumption, and many others) that only differ in their attribute specification (e.g. red car, blue car, yellow car – for the attribute color of the car). These specifications are often named "levels". Furthermore, conjoint analysis assumes that individuals view and evaluate objects (e.g. cars) holistically with all their attributes (often referred to as "CONsidered JOINTly") (Backhaus et al., 2016). All conjoint methods rely on this basic concept and mainly differ in the way these objects are presented to participants, how individuals can evaluate the presented objects and what level of analysis can be done based on the captured data. The following illustration (Figure 7) shows an example conjoint experiment case.[21]

Fig. 7: Illustration of a conjoint study



Source: Own illustration.

There are four main types of conjoint methods relevant to the research question of this dissertation. These different types are:

1. Conjoint value analysis (CVA – sometimes called traditional conjoint analysis (TCA) or rating based conjoint analysis (RBC))
2. Choice based conjoint analysis (CBC – sometimes referred to as discrete choice analysis)

[21] This is only an illustration of how a conjoint experiment can be presented to individuals. In this case, it is a choice based conjoint analysis with 3 choice sets.

3. Adaptive conjoint analysis (ACA)
4. Hybrid conjoint analysis (HCA)

Past entrepreneurship research has started to use conjoint methods starting in the year 1999 with a study by Shepherd (1999a). Since then, the majority of studies have used CVA approaches in VC decision-making or entrepreneurial career decision-making context (Lohrke et al., 2010). However, the number of studies in the entrepreneurship context that employ conjoint methods are still limited, compared to marketing research, which has employed conjoint approaches more often (Green & Srinivasan, 1990; Green et al., 2001; Lohrke et al., 2010; Agarwal et al., 2015). So far, VC decision-making research has not used CBC or ACA approaches.

The above mentioned types of conjoint analysis differ mainly in the way how objects are evaluated by individuals (this is defined as the depended variable in a conjoint analysis). Here, the first type of conjoint methods, CVAs can be implemented in two different ways. One way of implementing CVAs is to confront individuals with a set of objects and ask the individual to rank all objects in order of importance.[22] Another way is to ask individuals to rate an object one by one based on a Likert scale (e.g. such as the attractiveness of an object) (Kalish & Nelson, 1991; Wittink et al., 1994). The second type of conjoint methods, CBCs do not measure the decision based on a rating scale, but instead ask the individual to perform discrete decisions (e.g. yes or no). Within this method, individuals are confronted with several objects and need to decide which one they would chose or if they even would chose none of the objects presented to them (Wiley et al., 2010; Halme & Kallio, 2011). The third and fourth type of conjoint analysis, ACAs and HCAs try to measure the decision-making of individuals in a two-step process. In the first step, individuals are asked to indicate the importance and relevance of all attributes. Based on this indication by the individual, pair-wise comparisons are created that the individual need to decide on. That way, a highly individual data collection design is achieved (Johnson, 1987; Backhaus et al., 2015; Backhaus et al., 2016).

Another aspect relevant for all conjoint methods is the definition of an appropriate "stimuli" for the objects. A stimuli in terms of a conjoint analysis is the combination of attributes and levels that participants will be exposed to. Here two options exist. One is called "full-profile method", were all attributes of an object are simultaneously presented to the individual. Another option is the so called "trade-off-" or "two-factor-method" (Gustafsson et al., 2003).

[22] Another related method is to ask individuals several trade-offs between 2 different objects presented to them.

In this method not all attributes of an object are simultaneously presented to the individual, but instead always two attributes at a time. The choice between the two is mainly dependent on three aspects, such as cognitive capabilities of participants, link to reality, and duration of the study. As in conjoint analysis the correspondence to reality is seen as a key advantage of this method, full-profile methods are the most regularly used. The duration of the study is not significantly different within both configurations (Backhaus et al., 2016).

All the mentioned differ also in several other aspects. The following table (Table 21) compares conjoint methods in view of the described research questions and will elaborate why a CBC approach is chosen. As seen in Table 21, the methods are compared based on the decision approach, the easiness of use, level of realism, the engagement level, the duration per choice, possible modelling of utilities, sample size needed, estimation possibilities, and number of attributes and levels appropriate.

Tab. 21: Conjoint method comparison

Criteria	**CBC**	**CVA**	**ACA or Hybrid**
Decision approach	Discrete decision	Full preference ranking or rating	Mixture of ranking and decisions
Easiness of use	++	0	++
Level of realism	++	-	+
Level of engagement	++	0	++
Average duration per choice (in seconds)	19	> 4 min (ranking) 11 sec (single rating)	13
Possible modelling of utilities	Linear Optimal Discrete	Linear Optimal Discrete	Linear Optimal Discrete
Estimation on aggregate level	Yes	No	Yes
Estimation on individual level	Yes	Yes	Yes
Interaction estimation	Yes	No	Yes
Large number of attributes	-	--	++
Sample size needed	100	50	200

Legend: ++ very good + gut 0 average – little – not useful

Source: Own illustration based on Orme, 2009; Backhaus et al., 2015; Backhaus et al., 2016; Asioli et al., 2016.

As seen in Table 21, the different methods differ in many ways. In regards to the research questions of this dissertation, it is relevant to select the most appropriate method. First of all, VCs often receive the first information on an investment opportunity via email in the form of a teaser or a business plan. Research has shown that VCs investigate this information in a rather short period of time (Hall & Hofer, 1993). Moreover, investors use a combination of several criteria and do not investigate the opportunity based on isolated characteristics (MacMillan et al., 1987; Bachher & Guild, 1996). In addition to that, VCs come to a discrete decision (yes or no / go further or reject) within their screening activities to decide which companies to investigate further and which not, rather than rating each opportunity. This leads to an absolute decision (Tyebjee & Bruno, 1984; Fried & Hisrich, 1994; Boocock & Woods, 1997). Finally, within the screening process of VCs, they tend to rely on a limited set of criteria and not an exhaustive due diligence approach. Combining these findings with the research question, lead me to the choice of a CBC as the most appropriate method for this dissertation.

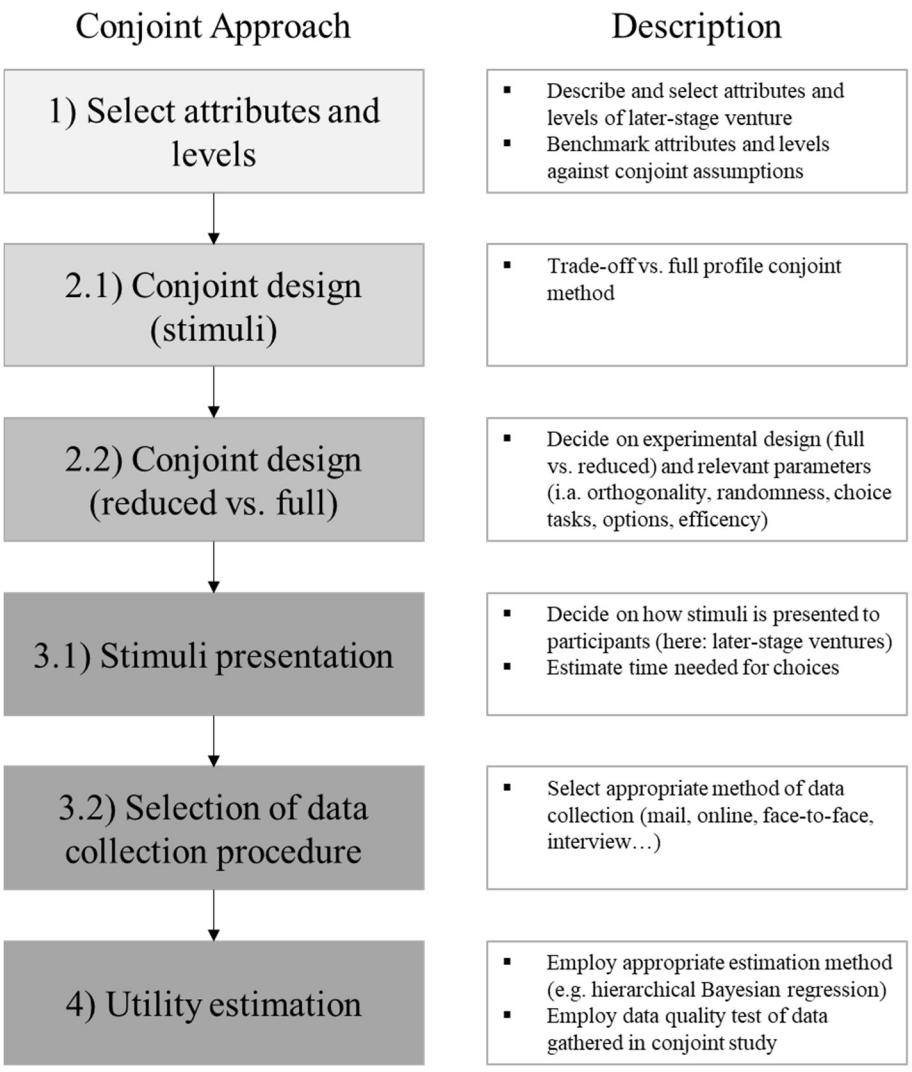
CBC approaches have not been used in previous studies that investigate decision criteria of VCs, arguably due to the software support needed to execute CBC studies, higher number of sample size needed, more complex analytic approaches needed to analyses the data and the general novelty of the method in the context of entrepreneurship research.

4.1.3 Conjoint design

This dissertation follows a recommended approach by the literature in order to execute and design a conjoint study (Orme, 2002; Gustafsson et al., 2003; Backhaus et al., 2016). As seen in Figure 8, a conjoint study starts with the selection of decision attributes and levels. Within CBCs it is generally recommended to not include more than six to seven attributes in a study, as otherwise the decision scenario is too complex for individuals (Orme, 2002). Based on the results from chapter 3, the following attributes were seen as the most relevant to investors:

- Revenue growth
- Business model design
- Profitability
- Current investors
- International scalability of the company
- Value-added of the product / service
- Track record of management team

Fig. 8: Conjoint design and execution plan



Source: Own illustration.

In order to specify the attributes and levels, both need to meet the following conditions in the context of a conjoint study: (1) attributes and levels need to be preference relevant, (2) attributes and levels need to be feasible, (3) attributes should be independent, (4) levels within each attribute should be mutually exclusive, (5) attributes that cannot be adequately described in words should be represented in multimedia, (6) approximately balance the number of levels across attributes, (7) attributes and levels should have a concrete meaning and (8) no so called "knock-out" level should be present (Orme, 2002; Weiber & Mühlhaus, 2009; Backhaus et al., 2016). Based on the interviews from chapter 3, the following decision attributes and levels were selected (see Table 22):

Tab. 22: Conjoint attributes and levels chosen for study

Attribute	Levels	Description[23]
Current revenue growth	10% p.a. 20% p.a. 50% p.a. 100% p.a.	Represents the venture's average yearly revenue growth rate over the last years.
Current profitability	Not profitable Break-even Profitable	Describes the current profitability of the venture.
Management team (track record)	No team member with relevant track record Some team member with relevant track record All team member with relevant track record	Describes if the management team has relevant track record (e.g. industry experience or leadership experience).
Value added for customers:	Low Medium High	Describes the value added for the customer through the product or service. Low value added represents marginal improvement (e.g. in cost-reduction or service quality), whereas high value added represents significant improvements.
Current investors	No external investors External investors - Unfamiliar to you External investors - Tier 1	Describes the type of current investor, if any.
International scalability	Easy Moderate Difficult	Describes the difficulty of scaling the venture internationally, in terms of the time and investment needed.
Business model[24]	Lock-in Innovation-centered Low cost Complementary offering	Describes the key focus of the venture's business model

Source: Own illustration.

First, the condition of preference relevance needs to be met (1). This can be assumed, as the attributes and levels were derived from qualitative analysis in chapter 3. The next condition (2) states that attributes and levels need to be feasible. This means that the described object

[23] The information on each attribute, level and the description and its operationalization in a conjoint study is explained in section 4.1.4.

[24] Additional explanation on the business models is displayed in the appendix (see Table A5).

(here: later-stage ventures) can be observed in reality and is not a combination of attributes that would never occur in reality. Asking a group of researchers and investors (see section 4.1.4) if all combinations of the different levels and attributes are observable in the market resulted in a confirmation that all combination of levels in Table 22 can be observed in the market. The third condition (3) states that attributes should be independent. Here, the attributes should not have an empirical dependency towards each other. This conditions implies, that two attributes and its respective levels can occur in reality and are seen as independent from each other by participants. This condition was additionally tested with a group of researchers and investors (see section 4.1.4). All confirmed the empirical independence of the stated attributes and levels in Table 22. Even if empirical studies show statistical relationships between two attributes (e.g. experienced team members have influence on profitability of a firm), as long participants confirm that these objects can occur in reality this assumption can be deemed appropriately fullfilled. Furthermore, if such dependencies are existing, statistical analysis can reveal them. If a strong dependency towards one attribute exist, one can expect this to be a highly dominant attribute criteria compared to all other attributes based on statistical analysis.

Furthermore, the attributes should be preference-independent from each other. This conditions states that the estimated utility of a specific level of one attribute is not influenced by another level of a different attribute.[25] However, this assumption can be violated in a conjoint analysis if interactions effects between attributes exist. This violation does not harm the efficiency of the estimation nor the conjoint analysis validity. In the context of this thesis, it is even an objective to understand potential interactions between decision criteria. This assumption is mainly relevant if scholars and practitioners want to make predictions on future decisions or to do market simulations based on an additive conjoint model (Backhaus et al., 2016).

The fourth condition (4) assumes that the levels within each attribute should be mutually exclusive. An example of a violation of this conditions can be described as follows: If an attribute (e.g. management team) of an object (e.g. later-stage venture) consists of three levels (e.g. a) industry experience; b) young age; c) entrepreneurial experience), the three levels are not mutually exclusive. If participants select a later-stage venture with a team that has industry experience over a team with entrepreneurial experience, this does not mean that the industry experience is more important to investors. It may be the case that both are equally important, but cannot be selected due to not been mutually exclusive.

[25] This is an assumption of an additive conjoint model.

The fifth conditions (5) assumes that if attributes or levels cannot be adequately described in words, they should be represented in multimedia. In order not to violate this assumption I have tested the attributes and levels from Table 22 with a group of researchers and investors (see section 4.1.4). All attributes and levels are adequately described from their point of view.[26]

The next condition, condition six (6), states that in a conjoint study the number of levels across attributes should be approximately balanced. This is to avoid the so called "number of level effect". A "number of level effect" is present, when a decision is influenced by the number of levels across different attributes. Attributes that have more levels tend to receive a higher importance than others. This is attributed to the phenomenon that participants assume that attributes with more levels indicate a higher relevance (Wittink et al., 1990; Wittink et al., 1992; Orme, 2002; Verlegh et al., 2002). In the case of this dissertation, the levels across attributes are nearly balanced. Only the attributes revenue growth and business model have one additional level compared to the others. As many of the research questions are focused on interaction effects of characteristics of the decision maker (e.g. entrepreneurial experience) or the investment firm (e.g. family office) with various attributes, the presence of number of level effects does not expose the empirical analysis to a major risk.

The seventh (7) condition states that attributes and levels should have a concrete meaning. In order to not violate this assumption I have tested the stated attributes and levels from Table 22 with a group of researchers and investors (see section 4.1.4). All attributes and levels had a specific meaning to them. Lastly, the eighth condition states that no so called "knock-out" level should be present in a conjoint study. This condition was tested with a group of researchers and investors (see section 4.1.4). All confirmed that no knock-out criteria was present and as soon as a venture passes a generic screening (this means matching investment size, geography, stage and industry), the investor will consider the venture in their actual screening process. Still though, statistical analysis can reveal levels with low utility and therefore indicate what type of later-stage ventures would not pass the screening.

After completing the first step to design a conjoint experiment (see Figure 8), the second step is to define the stimuli. The stimuli in terms of a conjoint study is the combination of attributes and levels that participants will be exposed to. Here two options are possible. The

[26] The information on each attribute, level and the description and its operationalization is explained in section 4.1.4.

first is to use a so called full-profile method, in which all attributes are presented to the participant simultaneously. The second being a trade-off method, in which attributes are presented in 1x1 matrices. However, based on the interviews and other research findings, VCs look at a later-stage venture with a holistic view. In reality VCs are not presented with information in 1x1 trade-off scenario, but rather see all information available on a venture all at once. This leads to the choice of a full-profile method for this dissertation.

Following the selection of the decision attributes and the stimuli, the next step involves the specification of the experimental design. This paragraph deals with the questions of what combinations of attributes and levels should be presented to participants to allow accurate estimations of individual and aggregated utilities, how to reduce the number of choices to an acceptable minimum and how to be able to estimate main effects and interactions effects. The first specification of the experimental design deals with the question whether a full or reduced design should be used. Within a full design, all possible combinations of the different attributes and its levels are presented to participants.[27] The objects to be evaluated by participants are later-stage ventures. This would mean the following number of possible later-stage ventures that would need to be evaluated by each individual:

$$3^5 \cdot 4^2 = 3{,}888\ combinations\ of\ levels$$

Even if multiple of these 3,888 different later-stage ventures are presented to participants simultaneously, this would still be far too many objects to be evaluated by a single individual. This is far from being feasible in reality, as participants would never complete a study were they are asked to do thousands of decision and moreover the cognitive capabilities would not allow reliable results. That is why conjoint studies can use reduced experimental designs to reduce the number of decisions that need to be taken by individuals and still allow accurate estimations of utilities. The overall goal of reduced design is to identify the subset of stimuli that represent a full-design as close as possible (Backhaus et al., 2016). There are many reduced design options available for CBC studies (Kuhfeld et al., 1994; Chrzan & Orme, 2000). In case of this dissertation, an asymmetric experimental design is applied, as the number of levels across attributes is not equal. In case of equal number of levels in each attribute, symmetric experimental designs can be used.

[27] There is no relationship between a full-profile conjoint analysis and a full-design. The terminology of "full" has a different meaning for the stimuli and the experimental design.

One way of constructing the experimental designs, is through orthogonality. This means that objects (here: later-stage ventures) are as orthogonal as possible within each design, so that two-way frequencies of various level combinations between attributes are nearly equally balanced and that within one choice task, attribute levels are duplicated as little as possible ("minimal overlapping") (Chrzan & Orme, 2000). A choice task is a combination of different objects that participants need to evaluate. This is a widely used method in conjoint studies, however it has some drawbacks. First of all, if scholars are interested in interaction effects between attributes, pure orthogonal designs will not be the most efficient.[28] Another way to construct experimental designs is through randomization. Here, the different attribute levels are randomly allocated to individuals and therefore allow overlapping. This dissertation uses a method called "balanced-overlapping" approach with a fractional asymmetric design, which is a combination of an orthogonal design with minimal overlapping and a randomized design. This is regularly seen as the best design strategy for CBC experiments (Chrzan & Orme, 2000), as it allows efficient estimates for various effects under consideration.

Next to deciding on the method to produce the experimental design, the number of choice tasks per participant need to be defined. Again, a trade-off decision needs to be taken between enough degrees of freedom through a larger number of choice tasks and the cognitive ability of individuals to provide reliable decisions. Research from Sawtooth Software indicates that a maximum of 20 choice tasks should not be exceeded in a conjoint experiment (Johnson & Orme, 1997). Here, this study implements 13 choice tasks with two options and no "none-option". 13 choice tasks were selected, as with the 13 choice tasks, estimates are still efficient and a test with researchers and investors revealed this as an adequate length of the study (see section 4.1.4). Moreover, 13 choice tasks are even slightly above other conjoint studies that use on average 12 choice tasks (Johnson & Orme, 1997). This approach constitutes a so called "forced" experiment, where investors need to decide between 2 alternatives (Street & Burgess, 2007). This way, no opportunity exists to avoid making a decision. This conditions implies that the participants are in reality in a situation where it does not make sense not to choose an option. Transiting this into the research context of this thesis, it can be assumed that if a later-stage

[28] Interactions are present if the joint effect of two attributes is different from the sum of their two main effect utilities (Chrzan & Orme, 2000).

venture has passed generic screening criteria of an investor (e.g. matching industry, stage, geography focus and investment size) it will be certainly under further consideration. This has also been confirmed by the interviews from chapter 3.

> *"[…] Of course by definition of our investor preference, we will not invest in specific industries. For example, if a semiconductor company approaches us, we will never invest, since it is out of scope of our investment criteria. […] But is there some deal breaking stuff in the beginning? Mhm, if the four criteria (stage. industry, size and location) are ok, then no. As I said, next to generic investment criteria we have, every company will be screened based on that criteria. Maybe really the sector is the only knock-out criteria."*
>
> *[Interview No. 6]*

Research has shown that participants may want to use the "none-option" for two reasons. First, they may chose the "none-option", if the object under consideration is not interesting at all to them (Haaijer et al., 2001). Based on the argumentation above, this seems not to be the case. Secondly, if the no alternative presented is not sufficiently attractive. In reality, investors are sometimes forced to make a decision to proceed to a due diligence, as they need to deploy capital in a rather short period of time. This underlines the use of no "none option" in the conjoint experiment. Moreover, methodological research has shown that incentive-aligned conjoint studies outperform other methods in their prediction power (Ding et al., 2005) and that scholars should conduct "studies in realistic settings using incentive structures that require participants to "live with" their decisions – Ding et al., 2005, p.67".

In order to enhance the conjoint study, two so called "hold-out" tasks are included in the study. These "hold-out" tasks are fixed choice task that are held constant over the entire sample of participants. So every participant is confronted with two exactly the same choice tasks. There are several advantages of this approach. First of all, hold-out tasks can be a proxy for the validity of the experiment, measured by ability of the individual estimated utilities from the random tasks to predict the two hold-out decisions. Secondly, it provides a check on the scaling of the estimated utilities (Orme & Johnson, 2014). As recommended by Orme & Johnson (2014), a minimum of two hold-out tasks are included in the conjoint study. The hold-out tasks are displayed in the appendix (see Table A6).

In additional to the experimental design, further measured are taken within this dissertation to avoid additional biases in the study. Here, order effects are relevant to investigate (Chrzan, 1994). In particular, research has shown that CBC analysis can suffer from three types of order effects. These are effects from the choice task order, the order of options in a choice

task and the order of attributes within a choice task. To avoid effects from choice task order, 800 different experimental designs are created with a random order of choice tasks within each experimental design. Moreover, to avoid effects from the order of options in a choice tasks, the two options within the 800 different experimental designs are randomly ordered within the respective choice tasks. In order to avoid order effects of attributes, the order presented to individual is randomized, but kept stable within one participant. In addition, individuals are randomly assigned to one of the 800 experimental designs. Before deploying the CBC study, the efficiency of the 800 experimental designs was tested, resulting in efficient estimates even with 60 participants.

After defining the conjoint design, the way of how the described experimental choice tasks are presented to the participants need to be defined. This thesis used a graphical representation of the choice tasks as shown in Street & Burgess (2007). Here, the choice tasks are designed as a table that has three columns. The first being the attributes and the second and third being the two choice options in the choice task. An illustration is displayed in section 4.1.4. In total 15 choice tasks are presented in this way to participants (13 random tasks and 2 hold-out tasks). Participants can then indicate their choice with a radio button below the table.

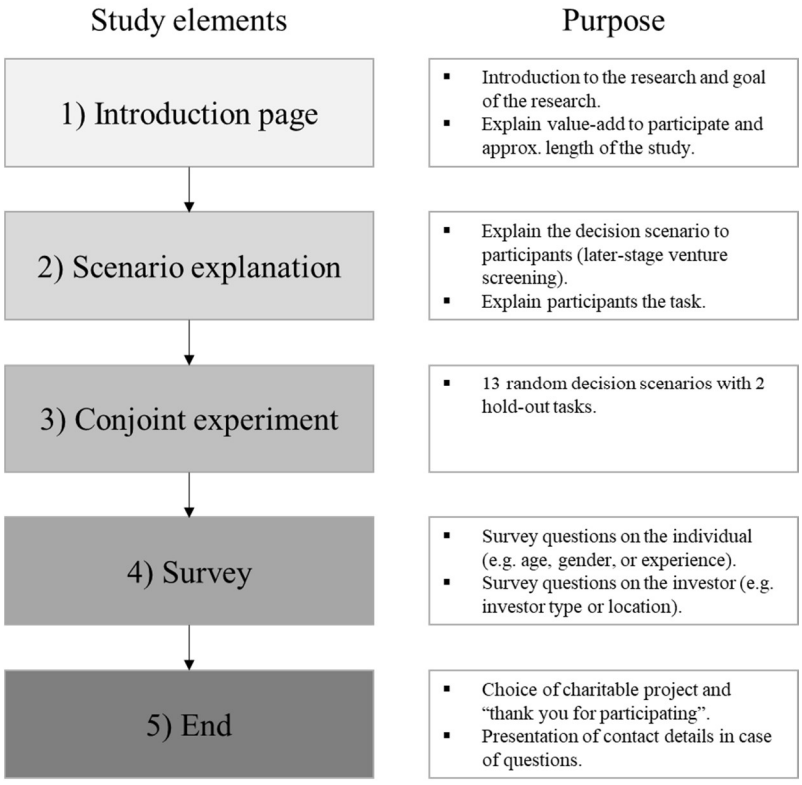
Following the design of how stimuli are presented to the participants, the data collection procedure is defined. Here many possibilities exist. These can be differentiated by the mean of interaction with participants (face to face vs. remote via post or email) and if they are computer assisted or not. Within this thesis, a computer assisted method was chosen as this allows proper execution of the CBC that is assisted by software that supports appropriate randomization and efficient data collection. As the target of this thesis is to collect decision behavior of many participants, a remote approach via email invitations was chosen, so that a large number of participants is reached. More details in section 4.1.4.

After defining the CBC approach, the last step involves the estimation of utilities from the gathered data and the execution of additional tests on the gathered data. All these elements are further explained in chapter 5, as part of the quantitative analysis of the gathered data.

4.1.4 Realization of CBC study

To execute a conjoint study, this thesis uses the software Sawtooth. Sawtooth is the leading software to design and execute conjoint analysis of various kind that is used by both thousands of practitioners as well as academics (Gustafsson et al., 2003).[29] In addition to the main conjoint design, additional elements (e.g. surveys) can be included in a study designed with Sawtooth. The already mentioned conjoint parameters and setup (see chapter 4.1.2 and 4.1.3) were implemented in Sawtooth (Lighthouse Studio Version 9) that also allows for online distribution of the study and has the advantage that participants can also participate via their mobile or tablet devices. The entire study that is implemented in Sawtooth is structured as follows (see Figure 9).

Fig. 9: CBC structure implemented in Sawtooth



Source: Own illustration

In the first element (introduction page), information on the purpose and goal of the research is presented, different incentives to participate are explained as well as information on

[29] Sawtooth Inc. holds annual scientific conferences on conjoint analysis and regularly publishes research papers on conjoint analysis in the so called "Sawtooth Software research papers".

the average time needed for a participants to complete the study. Moreover, contact details are presented in case of questions or problem experienced by the participants. The introduction page presented to participants can be found in Figure A2 in the appendix. After starting the study, participants are presented with decision scenario they are going to face and what they need to decide on. The decision scenario is described as follows: VCs will be confronted with later-stage ventures that have the following characteristics: 1) venture that has market traction & a validated business model, 2). the venture has multiple paying customers, 3) venture is showing growth in sales & customers and 4) venture has multiple employees and that they will be asked to decide which of the later-stage ventures they see will be the most attractive to them as a VC. This first page of the explanation can be found in Figure A3 and Figure A4.

After the initial explanation of the type of decision the participants will be confronted with, the exact decision scenario is described. Participants are told that they will be confronted with two different later-stage ventures that are in the same industry and have the same level of revenue. To avoid conflicts with generic screening criteria of VCs, they are told that the presented ventures match the geographical, industrial and investment size preferences of the investor. This in line with other studies (Franke et al., 2006; Franke et al., 2008). This approach is used to make results comparable across all participants.

Following this instruction, the decision scenarios (3 – conjoint experiment), are presented and the participants needed to decide which of the presented later-stage ventures they find most attractive as an investor and would rather choose to invest. In total 15 decision scenarios are presented (13 random tasks and 2 hold-out tasks – see figure A5 in the appendix). For some of the criteria, additional information was displayed to participants (e.g. explanation of the business models designs) in order to clearly explain each criteria as described in section 4.1.3. By hovering over the information displayed, this additional information is displayed.

After completing the third element (conjoint experiment), the fourth part consists out of a survey with several questions on the individual decision-maker and the investment company. This is necessary to gather additional data for further analysis and control measures. The complete survey can be found in the appendix in Figure A6-A10. Following the fourth element, the participant are able to enter their email address at the end of the study, if they are interested in the results of the study. Moreover, they are allowed to choose between several charitable projects to donate 1€ to (see Figure A11 in the appendix). The entire study is designed to take between 15 and 20 minutes.

Before inviting participants to take part, a test run is executed with four researchers and four institutional investors to identify technical issues or lack of clarity in the decision scenarios and the survey. Moreover, the entire study has been checked by a professional spelling-check agency. In addition to the information entered by the participants, Sawtooth allows to collect additional data on each participant to allow to perform further tests. These included the total time elapsed until completion, the time elapsed by each decision and the date of the completion of the study. The participants have been invited to the study via email. In total one invitation email has been send and three reminder emails. The invitation email and all reminder emails can be found in the appendix (see Figure A12-A15). The emails are always send at a different times of the day and in random batches of 500 participants per email. The study has been executed for a duration of 5 months from October 2016 to February 2017.

4.2 Sample selection

In order to select a sample for the empirical analysis, this thesis uses data from Pitchbook. Pitchbook is database that gathers information on private equity investors (buyout funds, VCFs, FOs, growth equity funds and others), on entrepreneurial ventures in various sectors and on deals between investors and these ventures. Pitchbook is regularly used for research in the field of private equity investments in entrepreneurial ventures (examples include: Paglia & Harjoto, 2014; Kaplan & Lerner, 2016; Brush et al., 2016; Zhelyazkov & Gulati, 2016). . It also includes all data from CrunchBase, a US centric database that tracks VC financing and is regularly used in entrepreneurial finance literature (examples include: Block & Sandner, 2009; Alexy et al., 2012; Werth & Boeert, 2013; Hallen et al., 2014). Other alternatives to Pitchbook exist, like CB Insights, Dealroom, Preqin or NVCA. However, Pitchbook shows a better coverage (Brown et al., 2015; Bowden et al., 2016) in regards to deals and investors tracked than others across the globe. Moreover, Pitchbook is one of the only major data sources that sources detailed information on the investment firm and investment professional level (e.g. email addresses, type of investor, names, or educational background) (Kaplan & Lerner, 2016). Every database also has its limitation. In the case of Pitchbook, some performance data of investors is not as accurately tracked as in other platforms (Bowden et al., 2016). However, this is deemed not to be important for the context of this thesis. As many deals in the VC industry are not disclosed, the database has a potential selection bias in only having data on disclosed deals. This is however an issue for all public and commercial databases.

The information provided by Pitchbook is mainly based on disclosed information from limited partners (LPs), filings of national regulators and other available public information. The gathered data from Pitchbook is regularly updated and various investor often update their own data in Pitchbook to allow a high quality of the gathered data. Moreover, Pitchbook offers detailed information on investors' teams and their contact details. This and the global coverage of Pitchbook, makes it an appropriate database for this thesis.

To create an initial sample for the conjoint study, several selection criteria are chosen to allow an approx. representative sample of VCs that invest in later-stage ventures. The following table list all selection criteria and the reason why these criteria are chosen (see Table 23). As seen in the table, this dissertation uses 5 items for the selection of investors (activity, later-stage deal experience, personal contact details, investor type and location). This allows to select the relevant investors from the database of Pitchbook.

Tab. 23: Sample selection criteria for conjoint study

Item	Characteristics	Reason
Activity	• Investors needs to have done at least 1 VC deal in last 10 years since 2016	• Avoid including inactive investors
Later-stage deal experience	• Investor needed to have done at least 1 VC deals in last 10 years since 2016 that were classified as Series A, Series B, Series C, > Series D or Expansion	• Avoid investors that do not invest in later-stage stage ventures • Avoid including investors such as accelerator or incubators
Personal contact details	• Individuals need to have an email address recorded	• Exclude investors that cannot be identified
Investor type	• Investors needed to be classified as VCFs, CVCs, FOs, buyout fund or growth equity fund or other VC classification	• Excluding investors that are not relevant to this study
Location	• Include only investors with a valid and recorded location	• Avoid investors with invalid location data

Source: Own illustration.

For each investor identified by the above selection criteria, the entire investment team of each investor is captured, including the following characteristics: Gender of individual, position in the firm, location of the investor and the investor type. Using this selection criteria and the described approach results in the sample of 15,600 individuals within 4,994 unique investors. The split of the sample by the described characteristics can be found in the following table (see Table 24).

Tab. 24: Sample characteristics by region | individual level

Region	N	%
Europe	8,923	57.1%
Asia	1,247	7.9%
Africa	64	0.4%
South America	514	3.3%
North America	4,366	28.0%
Oceania	486	3.1%

Source: Own illustration

As seen in Table 24, the majority of individuals come from North America and Europe. For later comparison of the respondents to the initial sample, further characteristics have been recorded. The first being the gender of the individuals in the sample. As seen in Table 25, the majority of individuals in the sample are male. In the sample, 14.2% of all individuals are female investors. This is in line with other sources (Brush et al., 2004; Teare, 2016; TechCrunch, 2016).

Tab. 25: Sample characteristics by gender | individual level

Gender	N	%
Male	13,384	85.8%
Female	2,216	14.2%

Source: Own illustration

Looking at the distribution of the sample by position within the investor, we can see that the majority of individuals hold senior positions in the investor firm (mainly partner positions) (see Table 26). This is mainly due to some smaller private equity investors having sometimes only partners as staff and no or a limited number of junior personnel.

Tab. 26: Sample characteristics by position

Position	N	%
Partner / CEO	6,861	43,9%
Founder / Co-Founder	921	5,9%
Investment Director / Principal	3,559	22,8%
Investment Manager / Manager	2,324	14,9%
Analyst / Junior	1,935	12,4%

Source: Own illustration

Moreover, the primary investor type of the investor is recorded in Pitchbook. If the investor did not have a primary investor type recorded, it was defined as undefined (this includes also a small fraction of business angels and other types of investors). The following table (Table 27), shows the distribution of participants by investor type. The majority of investor in the sample are VCFs and private equity investors (such as growth equity funds or buyout funds). Only a smaller fraction of individuals come from CVCs or FOs. Looking at other sources, this distribution seems similar to market characteristics (PwC, 2017).[30]

Tab. 27: Sample characteristics by investor type

Investor type	**N**	**%**
Venture capital fund	7,336	47,0%
Private equity fund	3,214	20,6%
Family office	503	3,2%
Corporate venture capital fund	813	5,2%
Undefined (Multiple definitions in Pitchbook)	3,734	23,9%

Source: Own illustration

[30] No other data could be found to support the mentioned distribution.

5 Conjoint analysis of investors' decision behavior

This chapter serves as the main section to analyze the key research questions of this dissertation with the captured data from the described conjoint experiment in chapter 4. It is divided in several subsections, first describing the captured data and executing quality tests on the data. This is followed by deriving several hypothesis on the decision behavior based on theory. Then these hypothesis are tested against the collected data.

5.1 Participants and data quality tests

In total, 749 investors participated in and fully completed the study. Although 795 completed the conjoint experiment, 46 investors did not finish the survey part and thus did not complete the study.[31] The 749 fully completed responses resulted in 19,474 recorded decisions from the conjoint experiment.[32] The sample size is significantly above the average range of between 40-85 participants found in previous studies employing conjoint methodology in the context of VCs' decision making (see section 2.2.2 and Lohrke et al., 2010). Before further describing the data collected from the 749 investors, initial tests were executed to assess potential biases, such as late-response bias, click-through behavior, or logical data issues. Table 28 illustrates the potential biases that were assessed in the captured data.

[31] Not many conclusions can be drawn about the characteristics of the individuals who did not finish the entire study, as no survey data was collected from them. Based on the initial information about the sample from Pitchbook, the proportion of males is similar to the final sample of 749 participants (91% in the sample of 46 participants compared to 88% in the final sample of 749 participants).

[32] $19{,}474 = 13\, random\ decision\ tasks \cdot 2\ options\ per\ task \cdot 749\ participants$. In addition to the random tasks, 2,996 decisions were recorded on the holdout tasks.

Tab. 28: Data quality tests – potential biases in the study

Potential bias	Employed tests
(1) Click-through behavior	Analyzing decision patterns.
(2) Low time spend per decision	Measuring time per choice against literature benchmark.
(3) Late-response bias	Two-sample t-test of equality of mean and two-sample test of proportions on various characteristics between first ½ and second ½ of the sample and between first ¼ and last ¼ of the sample.
(4) Non-response bias	Two-sample t-test of equality of mean and two-sample test of proportions on characteristics of 749 respondents versus initial selected sample of 15,600.
(5) External validity issues	Response rate comparison and literature review on external validity (*here: no direct test possible*).
(6) Question order bias	No additional test – as taken care of by design of conjoint study (see section 4.1.3).
(7) Decision bias	Regression of participants' characteristics against decision without attributes and levels from conjoint design.
(8) Logical data issues	Data logic tests on several characteristics.
(9) Reliability issues	Assessing prediction power of random tasks utilities for fixed task decision.

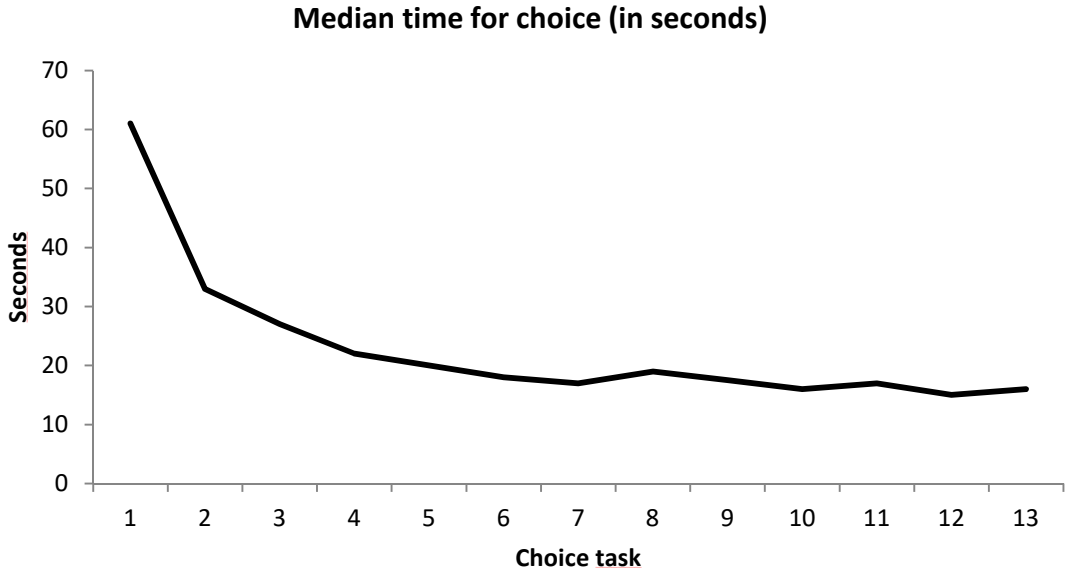
Source: Own illustration

The first potential bias analyzed refers to so-called "click-through behavior." This can be a problem in primary studies conducted via the internet, as participants may not take their time to fully read questions or tasks, but rather click through all questions to finish the study and profit from the potential benefits. Click-through behavior can be assumed when participants always follow patterns and do not show any variation in their answers; an example of this is when participants always tick the first answer in every question of a survey. Frequency tables are analyzed to identify participants that demonstrate this type of behavior. Only one participant was identified that always followed such a response pattern (in this case always selecting the first option of each question) and this participant was therefore removed from the sample.

Previous research has shown that it takes time for participants to process the information and make the respective decisions in a conjoint study (Johnson & Orme, 1996). To evaluate whether the participants in this study took an amount of time per choice task similar to that in other studies, the time per choice task was recorded. If participants had spent below average time on the choice task, this could provide evidence that participants might not have fully considered the task or that the task was too trivial for participants. On average, each random task took 21 seconds for participants to complete, which is consistent with other research showing

a 12 second average per choice task in CBC studies (Johnson & Orme, 1996). The median time per choice task (in seconds) can be seen in Figure 10.

Fig. 10: Time per random choice task



Source: Own illustration based on data from 749 participants.

Moreover, these findings are in line with comparable studies that show the decision time for the first choice tasks was longer compared to the last choice tasks (see studies reported in Johnson & Orme, 1996).[33] In addition, studies similar in length to this one demonstrate reliability and internal consistency of the captured data (Johnson & Orme, 1996).

The third bias investigated is referred to as a late-response bias (Dalecki et al., 1993, Zhao et al., 2009). Late-response bias is present when early participants have significantly different characteristics and behavior than late respondents. Other areas of research have shown that such a bias can have a significant influence on the answers captured from these participants and therefore can result in biased data that can lead to wrong conclusions (Pearson & Maier, 1995; Lasek et al., 1997). For example, late respondents may have made different conjoint decisions and given different responses than early respondents. To evaluate if such a bias is present in the collected data, several two-sample t-tests of the equality of means and two-sample tests of proportions for various characteristics between first half and second half respondents and between the first quarter and last quarter of the sample are executed. Tables 29 and 30 show

[33] Studies that investigate VC decision-making unfortunately do not report on the response time of participants.

the results of this analysis by displaying the mean values of the respective variables and reporting the tests for significant differences between the two samples.[34]

Tab. 29: Late response bias test – first ½ vs. second ½

Characteristic of sample	**First half** *(N=375)*	**Second half** *(N=374)*	**Δ between both and significance test[a]**
Individual characteristics			
Gender	0.858	0.903	-0.045†
Formal education	3.909	3.860	0.048
Educational background (law)	0.058	0.061	-0.002
Educational background (business or economics)	0.776	0.794	-0.018
Educational background (natural science)	0.114	0.098	0.015
Educational background (engineering)	0.250	0.221	0.028
Entrepreneurial experience	0.512	0.502	0.009
Age	3.333	3.211	0.122
Experience as investor	11.690	10.470	1.220†
Tenure	7.152	6.796	0.355
Financial performance index (cash-on-cash multiple)	251.512	251.861	-0.348
Leadership experience (mostly in startups or SMEs)	0.245	0.288	-0.043
Leadership experience (working in large firms & startups or SMEs)	0.389	0.382	0.006
Leadership experience (mostly in large firms)	0.365	0.328	0.036
Position in firm	1.850	1.925	-0.074
Investment firm characteristics			
Asset under management (AuM)	4.024	3.890	0.133
Number of staff	2.962	2.893	0.069
Limited partners (% private individuals)	32.296	33.064	-0.768
Limited partners (% private institutions)	43.154	42.066	1.087
Limited partners (% public institutions)	24.549	24.868	-0.319

*Note: [a] = t-test for equality of mean (ratio scaled variable) and t-test for equality of proportions (non-ratio scaled variables); († < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001)*

As seen in Table 29, no statistically significant differences for the characteristics mentioned can be identified between the first and second halves of the sample. Only a small statistically significant difference at the 10% level can be found for gender and experience as investors. In the second half of the sample, there are slightly more males and slightly fewer experienced investors; however, the significance level is only 10%. Therefore, it can be argued that

[34] Further explanation and descriptions of the variables in both tables can be found in section 5.2. Section 5.2 also provides information on the scale of each variable.

no late-response bias is present in the data. Additionally, the first and last quarter of respondents are compared across the same characteristics. Those results can be found in Table 30.

Tab. 30: Late response bias test – first ¼ vs. last ¼

Characteristic of sample	**First quarter** *(N=182)*	**Last quarter** *(N=183)*	**Δ between both and significance test[a]**
Individual characteristics			
Gender	0.867	0.913	-0.045
Formal education	3.906	3.853	0.052
Educational background (law)	0.066	0.054	0.011
Educational background (business or economics)	0.734	0.793	-.0058
Educational background (natural science)	0.127	0.108	0.018
Educational background (engineering)	0.276	0.206	0.069
Entrepreneurial experience	0.541	0.532	0.008
Age	3.458	3.271	0.186
Experience as investor	12.248	11.163	1.085
Tenure	7.325	7.271	0.054
Financial performance index (cash-on-cash multiple)	250.950	251.385	-0.435
Leadership experience (mostly in startups or SMEs)	0.270	0.336	-0.066
Leadership experience (working in large firms & startups or SMEs)	0.364	0.380	-0.015
Leadership experience (mostly in large firms)	0.364	0.282	0.082†
Position in firm	1.784	1.869	-0.085
Investment firm characteristics			
Asset under management (AuM)	4.104	3.826	0.278†
Number of staff	2.944	2.842	0.102
Limited partners (% private individuals)	33.187	35.635	-2.448
Limited partners (% private institutions)	43.602	39.385	4.216
Limited partners (% public institutions)	23.209	24.978	-1.768

*Note: [a] = t-test for equality of mean (ratio scaled variable) and t-test for equality of proportions (non-ratio scaled variables); († < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001)*

In line with the results shown in table 29, no statistically significant differences are found between the first and the last quarter of participants, except for two characteristics where differences were identified. As before, the significance level for these differences was only 10%.

After testing for late-response bias, additional tests are performed to test for potential non-response bias. To identify potential non-response bias, three specific variables and their distributions are compared between the initial sample of 15,600 people and the 749 actual participants; these characteristics are gender, position in the firm, and investment firm location. A comparison of investors included in the study to those that did not participate (non-response bias) revealed no significant differences in gender, position in the firm, or investment firm location at the 5% significance level.[35] Based on the similarity between non-participating and participating individuals, it is improbable that any non-response bias is present. The results of this analysis can be found in Table 31.

Tab. 31: Non-response bias test

Characteristic of sample	**Original Sample** *(N=15,600)*	**Completed studies** *(N=749)*	**Δ between both and significance test[a]**
Gender			
Male	85.8%	87.8%	0.020
Female	14.2%	12.2%	-0.020
Position in firm			
Partner or CEO[b]	49.3%	51.8%	0.025
Director or Principal[b]	22.8%	19.6%	-0.032†
Investment Manager	14.9%	16.5%	0.016
Analyst	12.4%	12.0%	-0.004
Location of investment firm			
Europe	57.1%	60.7%	0.036†
Asia	7.9%	9.8%	0.019†
Africa	0.4%	0.9%	0.005**
North America	28.0%	24.6%	-0.034†
South America	3.3%	2.0%	-0.013†
Oceania	3.1%	1.8%	-0.013†

Note: [a] = z-test for equality of proportions with $z = \frac{p_1 - p_2}{\sqrt{\bar{p}(1-\bar{p})(\frac{1}{n_1}+\frac{1}{n_2})}}$ *and* $\bar{p} = \frac{X_1 + X_2}{n_1 + n_2}$ *with n being the sample size, p being the proportion and X being the number of cases in the sample;*

*[b]= the group of founders, partners and CEOs have been grouped into one group (based on the original sample) to allow comparison with the sample data († < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001)*

In total, invitations were sent to 15,600 participants, with 3,600 bouncing back for several reasons that include wrong email account in the initial database, email accounts that had reached their size limit, or cases in which the individual was no longer working for the investor, leaving a sample of 12,000 individuals who received the invitation email. These 12,000 individuals were nested in 4,993 investors. The individual response rate for those who fully completed the study is 6.24% ($749 \div 12{,}000 = 6.24\%$) and the response rate at the individual firm level is 15% ($749 \div 4{,}993 = 15\%$). This response rate is in line with research with similar-sized samples using email-based approaches on non-student populations (Ranchhod &

[35] The African investors in the sample are an exception. However, they account for a very marginal part of the sample, therefore, this is not considered a relevant difference.

Zhou, 2001; Shih & Fan, 2009). Studies that investigate VC decision making do not report their response-rate and are often of an exploratory nature.

Moreover, the order of questions can have a significant influence on participants' responses and therefore result in biased data. To reduce this risk, several measures were taken to randomize the order within the decision tasks as much as possible (see section 4.1.3). Therefore, it can be assumed that the study does not suffer from question order effects.

An additional test is carried out to evaluate whether, in addition to the attribute levels presented in section 4.1.3, any other variable from the collected data had a direct influence on the participants' decisions ("*7 Decision bias*"). The test consists of a logit regression on the binary dependent variable (1=chosen; 0=not chosen) with all variables from Table 34 as covariates (see section 5.2). None of the covariates had a statistically significant influence or any explanatory power (see Table A7 in the appendix). The pseudo R^2 in Table A7 shows an explanatory power of 0, and the Wald χ^2 test indicates that all covariates have high likelihood of being simultaneously equal to 0, therefore having no significant explanatory power. Consequently, it can be assumed that beyond the attributes and levels presented, no other covariate had a direct influence on whether a person decided for the left or right later-stage venture.

In addition, logical data issues are investigated, such as a participant reporting being <25 years old, but indicating 30 years of experience as an investor. The following tests are executed to identify such logical data issues (see Table 32). The tests do not reveal any logical data issues. Therefore, it can be assumed that the recorded data does not suffer from such issues.

Tab. 32: Logical data issues - tests

Test	Result
(1) Tenure > experience as investor	No issue identified
(2) Age < experience as investor	No issue identified
(3) Age < Tenure with current investor	No issue identified

Source: Own illustration.

Another key methodological question is whether the executed conjoint analysis serves as a good predictor for real decisions *("(9) Reliability*"), which is rooted in questions of the validity of such experimental studies. However, actual validity is difficult to test and other studies have shown the external validity of conjoint analysis (Levin et al., 1983). Many studies show that estimated decision behavior with conjoint experiments correlates strongly with the real

observed behavior of people (Lerman & Louviere, 1978; Louviere & Hensher, 1983). Therefore, only re-test reliability can be tested within this study. Here, the two hold-out tasks are used to test the re-test reliability of participants' choices in the study. A proxy for re-test reliability can be estimated by assessing the utilities' ability to predict the two hold-out choice tasks from the 13 random choice tasks (see Table 33).[36] In this study, this leads to approximately 80.16% (40.08%+40.08%) accuracy for correct classification with the help of the estimated utilities, which is slightly above the results from other studies (Shepherd, 1999b). Table 33 shows the executed classification and its results.

Tab. 33: Validity test through fixed choice tasks (confusion matrix)

		Actual decision		
		Yes	**No**	**N | %**
Predicted decision	**Yes**	**1,201** *(40.08%)*	**297** *(9.91%)*	**1,498** *(50%)*
	No	**297** *(9.91%)*	**1,201** *(40.08%)*	**1,498** *(50%)*
	N | %	**1,498** *(50%)*	**1,498** *(50%)*	**2,996** *(100%)*

Source: Own illustration.

Taking the tests performed on the collected data as a whole, no source of significant bias has been identified in the data.

[36] The utility estimates from the 13 random choice tasks are computed using a hierarchical Bayes model (Lenk et al., 1996). The estimates are then used as covariates for a logit regression with the hold-out task choices as the dependent variable.

5.2 Descriptive statistics

To provide the first insights into the participants, Table 34 provides summary statistics on the data captured during the survey element of the conjoint study. It includes information on the variables gathered such as number of observations, mean, standard deviation, and minimum and maximum values of variables, as well as a description.

As seen in Table 34, the majority of the participants are men (88%), with only 12% being women. However, this is in line with research that shows that the majority of the staff of VCs are male (Brush et al., 2004; Hsu et al., 2014; Teare, 2016) and the proportion is similar to that in the target sample (see section 4.2). The statistics show that the majority of participants are between 35–44 years of age (similar to Hsu et al., 2014). On average, the participants have 11.08 years of experience working for a VC (standard deviation of 8.24), ranging from as low as one year to as high as 48 years of experience, and skewed to values below 11.08 years of experience. If a logarithmic scale is applied to experience, the distribution is approximately normally distributed. The average tenure of the participants with their current employer is 7 years. Compared to other studies, this sample exhibits slightly higher average experience with investors (Shepherd et al., 2003; Franke et al., 2008; Nunes et al., 2014). However, this can be explained by the number of partners/CEOs in the sample compared to other studies, as some investors comprised only partners.

Looking at the educational backgrounds of participants, the majority of the participants have a business or economics background (78%), followed by engineering (23%), natural science (10%), and law (6%). This is consistent with previous studies in this field (Bottazzi et al., 2004; Bottazzi et al., 2008; Franke et al., 2008; Zarutskie, 2010). In terms of formal education, the majority of the participants hold a master's degree or MBA in their respective field (similar to Zarutskie, 2010). Interestingly, half of the sample (50%) has entrepreneurial experience as a result of founding a firm in the past. The sample is approximately symmetrically split, with 369 participants with no entrepreneurial experience in the past and 380 with entrepreneurial experience. Out of the 380 participants with entrepreneurial experience, the average number of ventures founded is two. A small fraction of participants (around 6% of the 380) have founded more than five ventures in the past. Most investors hold three board seats in portfolio companies and are partners or investment directors in their firm. The participants present a nearly balanced working experience background, with 26% of participants having mostly worked in start-ups or SMEs, 38% both in large firms and start-ups or SMEs, and 34% in large firms.

Using Cash-on-Cash (CoC) multiples as the measure of individual financial performance, the average deal performance in the five measured categories is as follows. On average 21% are total losses, 27% exit with a small return of 1x–2x, 35% with returns between 2x and 5x, 11% with a multiple between 5x and 10x, and only a small fraction of deals (4.6%) result in very high returns of >10x. On average, out of 20 investments, one venture might be able to return a >10x multiple. Looking more closely at the variable (">10x CoC Multiple") for super high returns, the sample shows that a large fraction of investors (around 60%) has never done a deal returning a >10x multiple. To better characterize individual performance, an index across the five multiple measures was created using a weighted sum as follows:

$$Individual\ performance\ index = \sum_{i=1}^{5} i \cdot p_i$$

Here p_i represents the percentage value of the respective CoC measure in the sample. For example, p_1 represents the percentage value of deals that returned <1x. Figure A16 in the appendix shows that this index is approximatively normally distributed, further illustrating that only a small fraction of investors is able to achieve very high returns.

In addition to the individual level variables, Table 34 also displays variables on the investment firm level. Here, the majority of participants work in firms with 6–10 investment professionals. The most frequent fund size in the sample, measured as assets under management (AuM), is between 100 and 250M EUR. These relatively large values of AuM are in line with later-stage venture deals being larger in size than early-stage deals (see Figure 1 in section 1.1). For many years, VCs have invested increasingly more in international deals; however, many studies also illustrate their local bias (Cumming & Dai, 2010; Jääskeläinen & Maula, 2014). Results from these past studies are also reflected in the data gathered here. On average, 28% of all investor deals in the sample are made with foreign later-stage ventures, which in turn means that 72% are done with local ventures. However, the standard deviation of 30.58 shows that there is a significant variation in this variable, indicating that some invest >50% of their capital in foreign ventures. Moreover, investors in the sample have an average gross internal rate of return (IRR) between 11–20%. The sample furthermore consists of various investors types, as further detailed in Table A8 in the appendix. The majority of participants work in a VCF or growth equity fund; however, the sample also includes CVCs and FOs. In addition, many investors offer strategic advice (91%), business development support (81%), or mentoring (76%) to their portfolio companies. A smaller fraction of investors offers legal (22%) or marketing

support (30%) to their portfolio ventures. The majority of participants come from Europe and the US, with a small fraction from other regions. Table 34 also details the limited partner structure of the investors; however this is mainly interesting for non-CVCs or non-FOs, as both these institutions fund 100% of their capital from their corporate mother or family.

A correlation table of all individual-level variables in Table 34 is shown in the appendix in Table A9. As seen in Table A9, some interesting correlations exist. First, *experience as investor* correlates strongly with *entrepreneurial experience* (0.30), which may be a sign that entrepreneurial experience could be a path to becoming an investor in the long run. This ties in with another strong correlation between *entrepreneurial experience* and *position in the firm* (-0.42), indicating that individuals with entrepreneurial backgrounds often hold partner positions in investment firms. This might be due to specific knowledge and skills acquired while they were entrepreneurs, which they then bring to the investment firm. Interestingly, no strong correlation can be identified between individual performance and the other variables in the sample, so no hints can be drawn from these correlations about potential relationships between performance and other variables. However, individuals with more formal education have more senior positions in their investment firm (correlation of -0.13). No other strong correlations between variables were identified at the individual level.

Tab. 34: Summary statistics of sample

Variable	N	Mean	S.D.	Min	Max	Description
Individual level						
Gender	749	0.88	/	0	1	Gender of the respondent (dummy: 0 = female, 1 = male)
Age	749	3.27	1.15	1	6	Age of the respondent (1= < 25; 2=25-34; 3=35-44; 4=45-54; 5=55-64; 6= >64)
Experience as investor	749	11.08	8.24	1	48	Experience of the respondent as investor (in years)
Tenure	749	6.98	6.37	1	40	Tenure of the respondent with his / her current investor (in years)
Educational background (law)	749	0.06	/	0	1	Education background in law (dummy; 1=yes; 0=no)
Educational background (business or economics)	749	0.78	/	0	1	Education background in business or economics (dummy; 1=yes; 0=no)
Educational background (natural science)	749	0.10	/	0	1	Education background in natural science (dummy; 1=yes; 0=no)
Educational background (engineering)	749	0.23	/	0	1	Education background in engineering (dummy; 1=yes; 0=no)
Entrepreneurial experience	749	0.50	/	0	1	Experience as entrepreneur (dummy; 1=yes; 0=no)
Serial Entrepreneur[a]	381	2.35	1.43	1	10	Number of companies founded (1=1; 2=2; 3=3; 4=4;5=5; 6=6; 7=7; 8=8; 9=9; 10= >10)
Board seats	749	3.62	1.92	1	6	Number of board seats held by the respondent (1=none; 2=1; 3=2; 4=3;5=4; 6= >4)
Position in the firm	749	1.88	1.07	1	4	Current position of the respondent in the investment firm (1=Partner or CEO; 2=Director or Principal; 3=Investment Manager; 4=Analyst)
Leadership experience (mostly in startups or SMEs)	749	.26	/	0	1	Leadership experience (mostly in startups or SMEs) (dummy; 1=yes; 0=no)
Leadership experience (working in large firms & startups or SMEs)	749	.38	/	0	1	Leadership experience (working in large firms & startups or SMEs) (dummy; 1=yes; 0=no)
Leadership experience (mostly in large firms)	749	.34	/	0	1	Leadership experience (mostly in large firms) (dummy; 1=yes; 0=no)
Individual performance[b]	749	251.68	53.35	100	430	Cash-to-cash multiple measure for individual financial performance.
<1x CoC Multiple	749	20.98	20.97	0	100	Percentage of deals that returned <1x invested capital
1x-2x CoC Multiple	749	27.04	21.25	0	100	Percentage of deals that returned 1x-2x invested capital
2x-5x CoC Multiple	749	35.94	25.48	0	100	Percentage of deals that returned 2x-5x invested capital
5x-10x CoC Multiple	749	11.35	12.88	0	100	Percentage of deals that returned 5x-10x invested capital
>10x CoC Multiple	749	4.67	7.84	0	50	Percentage of deals that returned >10x invested capital
Syndication preference	749	2.47	1.10	1	4	Syndication preferences of investors (categorical: 1= Investing alone; 2=Investing together with one investor; 3=Investing together with > 1 investor; 4=Indifferent)
Formal education	749	3.88	0.57	1	5	Highest formal education (categorical: 1=less than high school degree; 2=high school degree; 3=bachelor degree; 4=master degree or MBA; 5=PhD or doctoral degree)
Investment firm level						
Staff	749	2.92	0.87	1	4	Number of investment professionals in the investment firm (excluding administrative staff) (1=1; 2=2-5; 3=6-10;4=more than 10)
Assets under management	749	3.95	1.49	1	6	Assets under management (1=less than 10m; 2=11m-25m;3=26m-100m; 4=101m-250m; 5=251m-999m; 6= more than 1bn)
Cross-border deals	749	28.94	30.58	0	100	% of deals done with foreign ventures relative to all ventures
IRR[b]	633	3.72	0.98	1	6	Average IRR of the firm (1=less than 0%, 2=1-10%; 3=11-20%; 4=21-30%; 5=31-40%; 6=more than 40%)

Investor type	749	2.79	1.34	1	7	Investor type (1=CVC; 2=VC; 3=Growth equity fund; 4=Buyout fund; 5=Family office; 6=Angel; 7=Venture debt)
X2X	749	1.30	.047	1	3	Type of firm mainly invested in (categorical: 1=B2B; 2=B2C; 3=C2C or P2P)
Stage: Seed Stage	749	0.31	0.46	0	1	Investment focus: development stage (dummy: 0=not investing in this stage; 1= investing in this stage) – seed stage
Stage: Early Stage	749	0.58	0.49	0	1	Investment focus: development stage (dummy: 0=not investing in this stage; 1= investing in this stage) – early stage
Stage: Growth Stage	749	0.62	0.48	0	1	Investment focus: development stage (dummy: 0=not investing in this stage; 1= investing in this stage) – growth stage
Stage: Late Stage	749	0.24	0.42	0	1	Investment focus: development stage (dummy: 0=not investing in this stage; 1= investing in this stage) – late stage
Industry: Software & services	749	0.67	/	0	1	Investment focus: industry (dummy: 0=not investing in this industry; 1= investing in this industry)
Industry: IT infrastructure/systems	749	0.39	/	0	1	Investment focus: industry (dummy: 0=not investing in this industry; 1= investing in this industry)
Industry: Financial services	749	0.34	/	0	1	Investment focus: industry (dummy: 0=not investing in this industry; 1= investing in this industry)
Industry: E-Commerce	749	0.36	/	0	1	Investment focus: industry (dummy: 0=not investing in this industry; 1= investing in this industry)
Industry: Biotechnology & healthcare	749	0.37	/	0	1	Investment focus: industry (dummy: 0=not investing in this industry; 1= investing in this industry)
Industry: Media & entertainment	749	0.27	/	0	1	Investment focus: industry (dummy: 0=not investing in this industry; 1= investing in this industry)
Industry: Consumer products & services	749	0.42	/	0	1	Investment focus: industry (dummy: 0=not investing in this industry; 1= investing in this industry)
Industry: Industrials & industrial technology	749	0.40	/	0	1	Investment focus: industry (dummy: 0=not investing in this industry; 1= investing in this industry)
Industry: Energy	749	0.17	/	0	1	Investment focus: industry (dummy: 0=not investing in this industry; 1= investing in this industry)
Industry: Other	749	0.08	/	0	1	Investment focus: industry (dummy: 0=not investing in this industry; 1= investing in this industry)
Value-added-services: Coaching / mentoring	749	0.76	/	0	1	Value added service provided to portfolio company (dummy: 0=no; 1=yes)
Value-added-services: Strategic advise	749	0.91	/	0	1	Value added service provided to portfolio company (dummy: 0=no; 1=yes)
Value-added-services: Recruitment support	749	0.59	/	0	1	Value added service provided to portfolio company (dummy: 0=no; 1=yes)
Value-added-services: PR / marketing support	749	0.30	/	0	1	Value added service provided to portfolio company (dummy: 0=no; 1=yes)
Value-added-services: Business development support / client introduction	749	0.81	/	0	1	Value added service provided to portfolio company (dummy: 0=no; 1=yes)
Value-added-services: Support next fundraising	749	0.69	/	0	1	Value added service provided to portfolio company (dummy: 0=no; 1=yes)
Value-added-services: Legal support	749	0.22	/	0	1	Value added service provided to portfolio company (dummy: 0=no; 1=yes)
Region	749	1.83	/	1	5	Location of investor in regions (categorical: 1= Europe; 2=North America; 3=South America; 4=Asia; 5=Oceania)
Limited partner structure (Private individuals)	749	32.67	36.97	0	100	% of total fund that is coming from private individuals (e.g. HNWI)
Limited partner structure (Private institutions)	749	42.61	35.00	0	100	% of total fund that is coming from private institutions (e.g. corporates)
Limited partner structure (Public institutions)	749	24.70	30.28	0	100	% of total fund that is coming from public institutions (e.g. governmental funds)

Note: a = Number of observations is smaller, as this question was only asked to individuals that had entrepreneurial experience in the past; b =Index that is calculated over the individual cash-to-cash (CoC Multiples) performance of the decision maker; b = 116 participants did not want to answer this question.

5.3 Decision behavior estimation & utility[37]

First, this study explores descriptive information on the decisions taken in the conjoint study. Initially, I compute the ratio of how many times a concept including a certain attribute level is chosen by participants, divided by the number of times a concept including that attribute level appeared in the choice task. This ratio is named PC ("percentage chosen"), which is displayed in Table 35. It gives an indication on the ranking of levels in a given attribute.

There is considerable heterogeneity with regard to the PC in the various attributes. Participants showed a higher preference for later-stage ventures with a strong track record of the management team (60.20), high revenue growth (65.80), profitable business (58.12), high value-added of the product (63.53), and easy international scalability (59.09). However, participants showed no clear preference between no external investors being already present in the venture and external investors already being present. Reputable investors ("external investors – Tier 1") were more often (55.33) selected than the other attribute levels, indicating a preference of participants towards more reputable investors in their screening activity. Also, participants preferred lock-in business models (54.54) and innovation-centered (53.82) business models over low-cost and complementary offering business models.

The preference for an attribute level can depend upon the attractiveness of the other alternatives within that same attribute. Therefore, it is inappropriate to compare the PC ratio across attributes. Moreover, no conclusions can be drawn on the relative importance of the attribute compared to other attributes. Here, multivariate approaches outlined in the following section, are necessary.

[37] This section of the dissertation is part of a joint research paper with Jörn Block (University Trier) and Christian Fisch (University Trier).

Tab. 35: Percentage chosen ratio ("PC")

(1) Management team (track record)				(2) Current revenue growth			
Level	Cases shown	Cases chosen	PC	Level	Cases shown	Cases chosen	PC
None	6,491	2,383	36.71	*10% p.a.*	4,869	1,668	34.26
Some	6,495	3,447	53.07	*20% p.a.*	4,870	2,151	44.17
All	6,488	3,906	60.20	*50% p.a.*	4,876	2,720	55.78
				100% p.a.	4,859	3,197	65.80
(3) Current profitability				(4) Current investors			
Level	Cases shown	Cases chosen	PC	Level	Cases shown	Cases chosen	PC
Not profitable	6,481	2.608	40.24	*No ext. investors*	6,518	3,055	46.87
Break-even	6,491	3,349	51.59	*Ext. inv. –Unfamiliar*	6,497	3,097	47.80
Profitable	6,502	3,779	58.12	*Ext. inv. - Tier 1*	6,477	3,584	55.33
(5) Business model				(6) Value-added of product / service			
Level	Cases shown	Cases chosen	PC	Level	Cases shown	Cases chosen	PC
Lock-in	4,868	2,655	54.54	*Low*	6,490	2,236	34.45
Innovation-centered	4,868	2,620	53.82	*Medium*	6,515	3,390	52.03
Low cost	4,875	2,122	43.53	*High*	6,469	4,110	63.53
Complementary offering	4,863	2,339	48.10				
(7) International scalability							
Level	Cases shown	Cases chosen	PC				
Difficult	6,486	2,577	39.73				
Moderate	6,511	3,332	51.17				
Easy	6,477	3,827	59.09				

PC = Percentage chosen – This measure is calculated by dividing the number of times a later-stage venture was chosen with the respective level by how many time it was shown ($\boldsymbol{PC} = \frac{\boldsymbol{Cases\ chosen}}{\boldsymbol{Cases\ shown}}$*). The higher this ratio the more often ventures with this level were chosen. As levels are nearly fully balanced in a given attribute.*

A multi-level logit model is used to measure the importance attached to the different screening criteria and their attribute levels. The decision made by participants (1 = chosen; 0 = not chosen) serves as the binary dependent variable, while the different attribute levels of the later-stage venture are used as independent variables. The use of multi-level (hierarchical) regressions is recommended if the observations are nested (i.e., the data has a hierarchical / multi-level structure) and if effects on multiple levels, and in particular across levels, are evaluated at the same time (Aguinis et al., 2013). Within this study, two levels exist: multiple decisions (level one) are nested within each individual (level two) and cannot be seen as independent from each other. The full regression model employed is estimated using the following equation:

$$\log\left(\frac{\varphi_{ij}}{1-\varphi_{ij}}\right) = \beta_{0j} + \beta_{ij}x_{ij}$$

$$\text{with } \beta_{ij} = \gamma_{i0} + u_{ij}$$

Here φ_{ij} represent the probability of a positive decision, conditional on β_j, for the choice *i* for respondent *j*. x_{ij} represents the independent variables *x* for the choice *i* for respondent *j*. In the base model, these are all attributes used in the conjoint experiment that were displayed to individuals (see chapter 4.1.3).[38]

Table 36 shows that nearly all attribute levels significantly influence the decision of the investor (on a significance level of at least 0.1%). Investors are only indifferent within the attribute "current investors". Here, participants are indifferent between no external investors being present and external investors being present that are unfamiliar to the participant. Interestingly, investors significantly favor reputable investors (Tier 1) being present over no external investor being present, indicating a positive effect of investors reputation due to potential screening and portfolio development expertise of these reputable investors (Nahata, 2008) over costs associated in dealing with additional external shareholder syndication (Manigart et al., 2006). In addition, investors show a statically significant preference towards lock-in business models over low-cost business models. The same is true for innovation-centered business models, indicating that lock-in and innovation-centered models are preferred over others. This might be due that innovation-centered models and lock-in models are easier to protect from competi-

[38] The regression models are calculated using HLM7 from SSI (Scientific Software International).

tors than the other models (Amit & Zott, 2001), for example due to switching costs. Also innovation-centered business models matter to the performance of entrepreneurial firms, providing an argument why VCs might prefer such models (Zott & Amit, 2007).

In order to further evaluate and compare the effect sizes of the various attribute levels, odds-ratios are computed and graphically illustrated in Figure 11.[39]

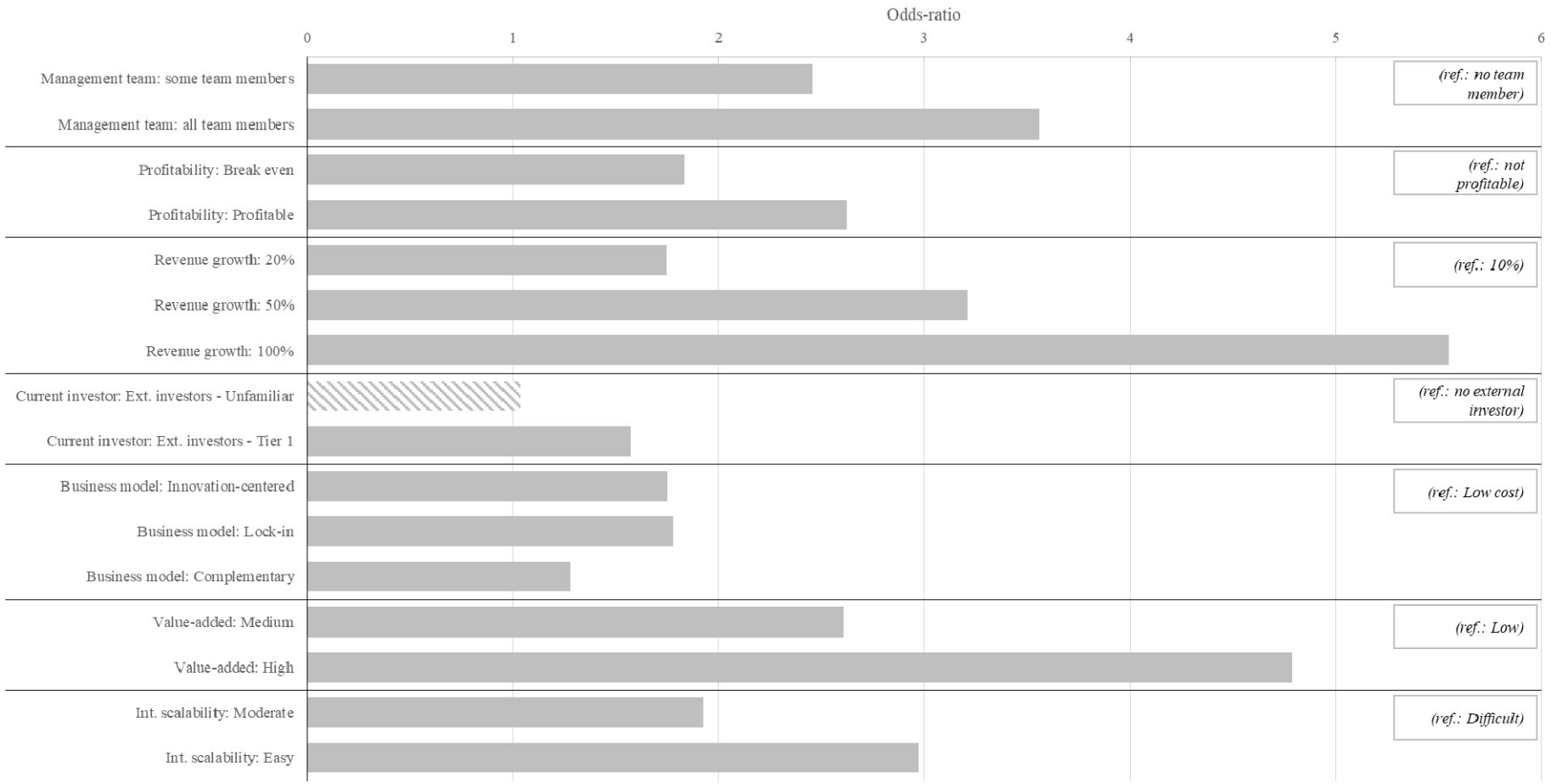
Tab. 36: Multi-level logit regression

Log-odds	**Main model**
Attributes und levels	
Management team: some team members	0.898*** (0.051)
Management team: all team members *(ref.: no team member)*	1.269*** (0.058)
Profitability: Break even	0.604*** (0.051)
Profitability: Profitable *(ref.: not profitable)*	0.964*** (0.061)
Revenue growth: 20%	0.557*** (0.052)
Revenue growth: 50%	1.166*** (0.060)
Revenue growth: 100% *(ref.: 10%)*	1.713*** (0.065)
Current investor: Ext. investors - Unfamiliar	0.035 (0.048)
Current investor: Ext. investors - Tier 1 *(ref.: no external investor)*	0.452*** (0.054)
Business model: Innovation-centered	0.561*** (0.058)
Business model: Lock-in	0.577*** (0.058)
Business model: Complementary *(ref.: Low cost)*	0.246*** (0.055)
Value-added: Medium	0.958*** (0.052)
Value-added: High *(ref.: Low)*	1.566*** (0.058)
Int. scalability: Moderate	0.655*** (0.048)
Int. scalability: Easy *(ref.: Difficult)*	1.088*** (0.054)
N (decisions)	19.474
N (individuals)	749

*Note: Robust standard errors in parentheses; † < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001; Model is calculated using random intercepts and random slopes.*

[39] Here odds ratios are computed by: $e^{(\log odd\ estimate)}$.

Fig. 11: Odds-ratios of levels



Note: Belted bar indicates no statisticially significant effect relative to the base category. N=749. Reference category of each attribute on the right hand side.

As can be seen in Figure 11, the effect sizes of the attribute levels for revenue growth are particularly high. Later-stage ventures with a historical revenue growth rate of 100% p.a. have an odds-ratio of 5.54, indicating that these later-stage ventures have a 5.54 higher chance of a positive decision (selection) by an investor relative to ventures with a 10% revenue growth rate. Regarding track record of the management, the odds-ratio of all team members having a relevant track record is estimated at 3.55, indicating a 3.55 higher chance of positive decision of the investors relative to ventures with a management team where none of its members has a relevant track record. Overall, the chance of a positive screening decision by the investor is strongly affected by high values in the attributes (1) revenue growth, (2) value-added of product / service, and (3) management team track record; the design of the business model and the type of existing investors matter but are of lower importance. The same is true for the profitability of the venture and the easiness of scaling the venture internationally.

In addition, a hierarchical Bayes model is estimated to describe the relative importance of each attribute (Lenk et al., 1996; Orme, 2000).[40] Hierarchical Bayes estimations are particularly important for data collected via conjoint studies (Green et al., 2001). Such models follow several assumptions and principles. First, it is assumed that individuals' parameters (betas or utilities) can be described by multivariate normal distributions (Orme, 2000). These distributions are based on a vector of means and a matrix of covariances. It is assumed that, given an individual´s beta or utility, the probability of that person choosing a particular outcome (here: chosen a later-stage ventures) is governed by a model (e.g. logit regression) (Orme, 2000). The following statement by researchers from Sawtooth illustrate the functioning of these type of models:

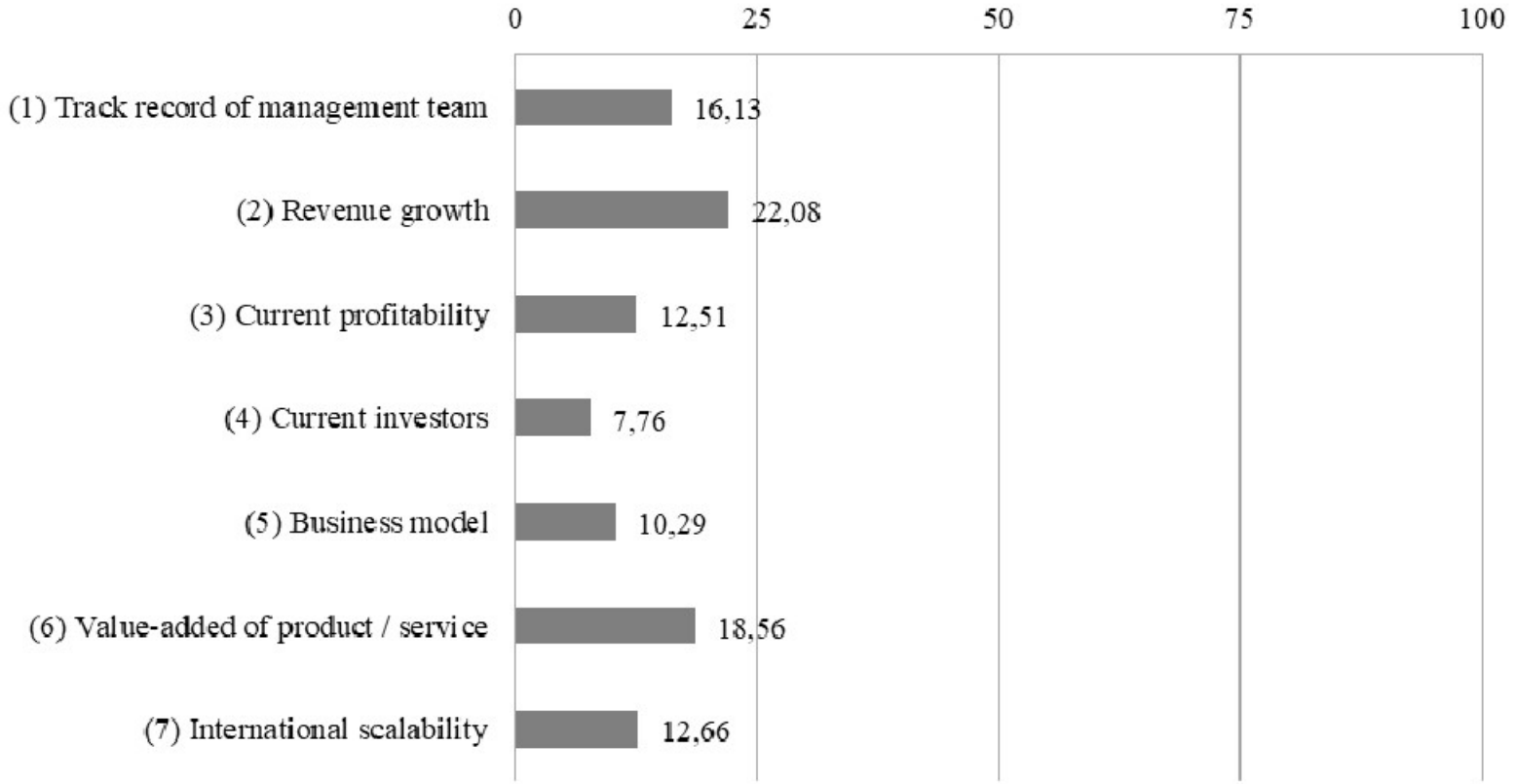
> *"Initial crude estimates of betas are estimated for each respondent to use as a starting point. New estimates are updated using an iterative process called "Gibbs Sampling." The model estimates individual betas as well as the mean and covariances of the distribution of betas. In each iteration, an estimate is made for each parameter, conditional on current estimates of the others. This is done by making a random draw from each conditional distribution. Eventually, after many iterations, this process converges to correct estimates for each parameter. In other words, the HB algorithm produces betas that fit each individual's outcome reasonably well, but "borrows" information from other respondents to stabilize the estimates."*
>
> [Orme, 2000, p.2]

[40] An additional advantage of hierarchical Bayes estimations is that coefficients can be estimated separately for each individual compared to just an average of all people, allowing to separate signals from noise in data (Orme, 2000).

This approach has several advantages as it also allow to estimate individual-level models in a similar way supervised machine-learning algorithm do (Kotsiantis et al., 2007) and identify heterogeneity in probability distributions that lead to different beta estimates. Figure 12 displays the results of such a model. In order to more easily compare the results, the values are normalized (zero-centered) such that the sum of all importance values yield 100%.

In contrast to many studies focusing on early-stage ventures outlined by the literature review in chapter 2.2 (e.g. Franke et al., 2008, Hsu et al., 2014 or Nunes et al., 2014), this dissertation is focusing on later-stage ventures. Results show that the track-record of the management team is not the most important decision criteria for investors. The most important decision criteria for investors seem to be financial growth in the form of current revenue growth (22.08) and the value-added of the product / service that the venture is providing (18.56). Following these three attributes, participants put importance to the current profitability of the venture and considered the international scalability of the venture as being nearly equality important. Interestingly, the current investors of the later-stage venture and the design of the business model play only a relatively minor role in the consideration of the investors.

Fig. 12: Relative importance of attributes – beta estimates using hierarchical Bayes model



Note: N=749; The displayed figures represent the difference in estimated utility by attribute, zero-centered across all attributes. This provides a measure g how much difference each attribute could make in the total utility of a later-stage venture. The higher a value, the more impact a small change in a level in this attribute can make to the overall utility, relative to other attribute levels.

Another research question concerns potential interactions between the different screening criteria, meaning for example that the effect / beta of one attribute level can be de- or increased by a high value of another attribute level (interaction effect). To explore these relationships empirically, this dissertation explores interaction terms between attribute levels by multiplying them with each other. As the conjoint study in this dissertation is a discrete choice experiment (CBC) and to estimate the importance of each attribute level a non-linear model was used, interactions need to be interpreted differently and with caution compared to linear models (Ai & Norton, 2003). Just investigating coefficients from regression estimates and the respective significance indication via p-values is not sufficient. Here, this dissertation investigated the most important attribute from Figure 12, which is current revenue growth and interact it with each of the other attribute levels. In order to determine direction, magnitude and significance of the interaction, this study relies on a simulation-based approach in conjunction with a graphical analysis (King et al., 2000; Zelner, 2009) and the computation of marginal effects. Figure 13 shows the estimated marginal effects for all interactions for different levels of the independent variables.

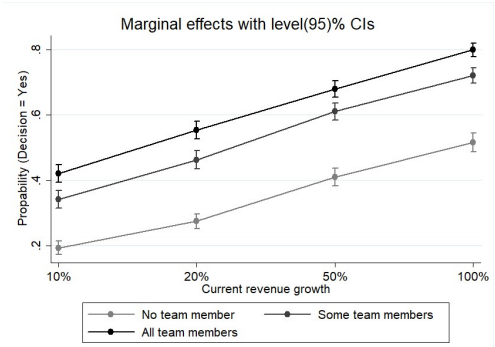
In order to identify the direction and significance, the simulation-based approach by Zelner (2009) was used in order to graphically describe further the interaction. Figure 14 displays the change in predicted probability for a positive choice (decision = yes) for the interactions based on the approach by Zelner (2009). An increasing slope in Figure 14, that is not crossing the zero, indicates that the perceived importance is increasing for the interacted variable for increasing levels of revenue growth on the x-axis and is statistically significantly different from zero. Figure 13 and Figure 14 give evidence that the perceived importance of all management team members having a relevant track record is increased by higher revenue growth relative to no team members or some team member having a relevant track record. However, this seems only to be the case for revenue growth till 50%. From 50% to 100% revenue growth, we can see a slight decrease in perceived importance of this relationship. Next to this, the perceived difference in importance between high and medium value-added / low value-added of the product is reduced for higher revenue growth values (from 50%). The perceived importance of Tier 1 investors being present compared to no-investor being present is less pronounced for higher levels of revenue growth (starting from 10%), indicating a reduced importance of Tier 1 investors for high revenue growth rates. Interactions between business model and revenue growth did not show significant interactions, as all estimated differences in predicted probability are not different from zero. The perceived importance of easy international scalability is also

less pronounced for higher values of current revenue growth. For many of the interactions, high revenue growth (100% p.a.) often reduced the importance of other attributes. However, even though this analysis can find some significant interactions between attribute levels, the magnitude of many of these interactions are rather small with in all cases less than 4% impact on the predicted probability, but the majority showing around 1%-2% impact. The magnitude of the effects can be seen in Figure 14 in the difference in probability between one specific point on the x-axis (e.g. 10% current revenue growth) and another point on the x-axis (e.g. 20% current revenue growth).

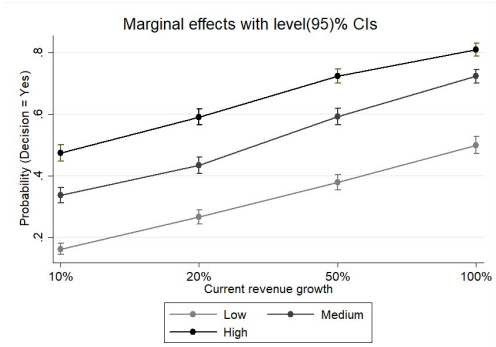
An explanation of this finding might be in the strong signaling effect of very high revenue growth to the investors. This might be so strong that it provides investors high confidence on the future value of the company than no other attribute. On the other hand side, a strong management team track record seems to provide investors with confidence and compensate for relatively low revenue growth rates. However, as stated above, the magnitude of such effects remains small.

Fig. 13: Marginal effects of interactions – revenue growth x other attributes

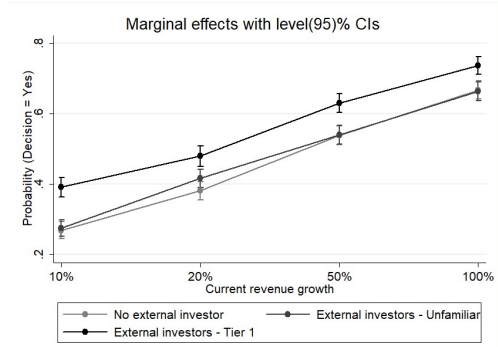
Revenue growth X Management team (track record)



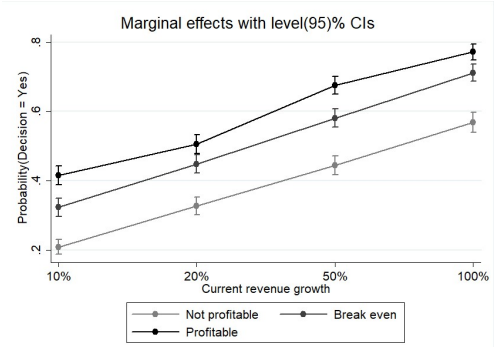
Revenue growth X Value-added of product / service



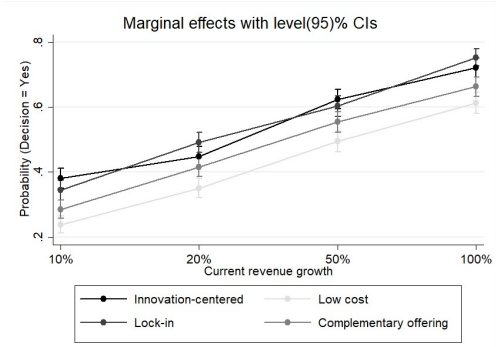
Revenue growth X Current investor



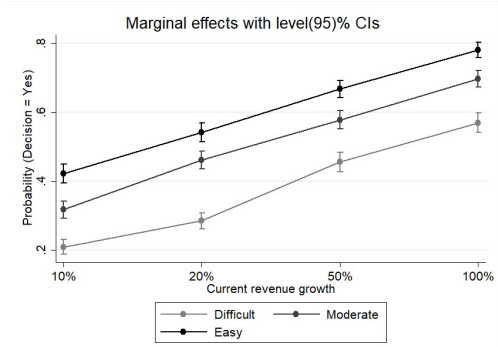
Revenue growth X Profitability



Revenue growth X Business model



Revenue growth X int. scalability



Note: N=749; The graph displays the estimated marginal effects on the probability of chosing a later-stage venture for different values of current revenue growth (x-axis) and the interacted variables (see legend), including 95% confidence intervals. The marginal effect is the average change in probability, giving the different values of the interaction. These marginal values are derived from the base model in Table 36.

Fig. 14: Difference in predicted probability – simulation-based approach by Zelner (2009)

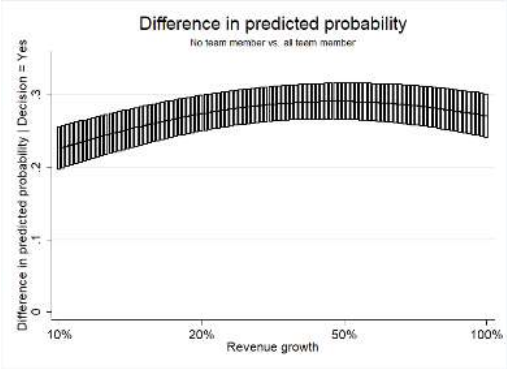
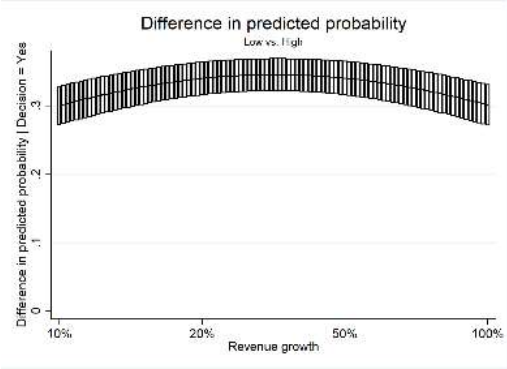
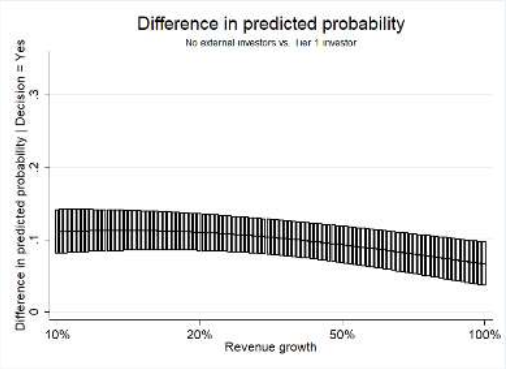
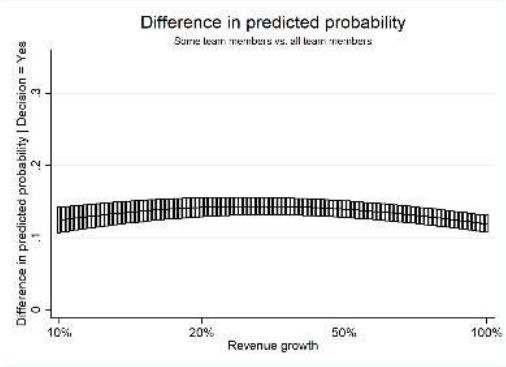
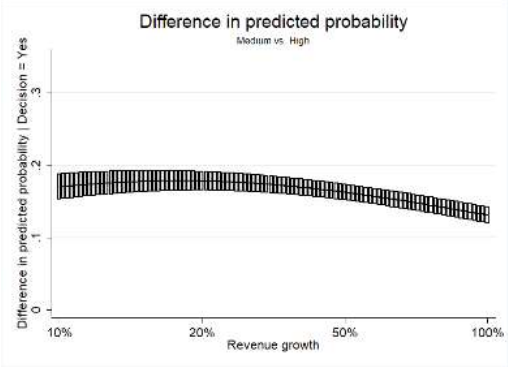
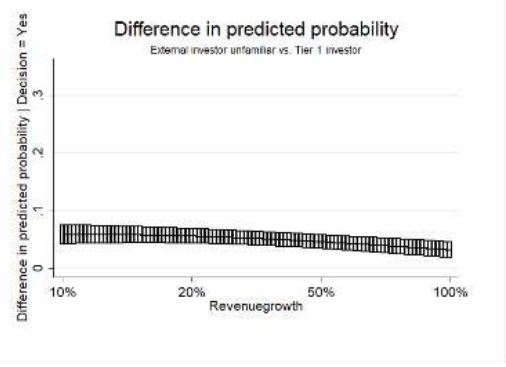
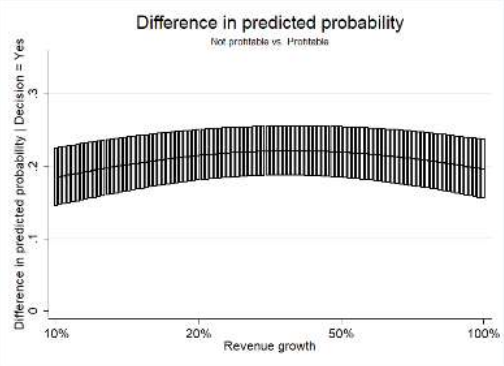
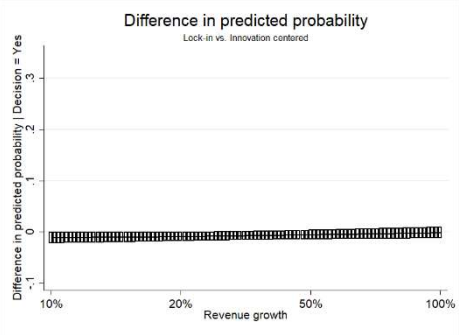
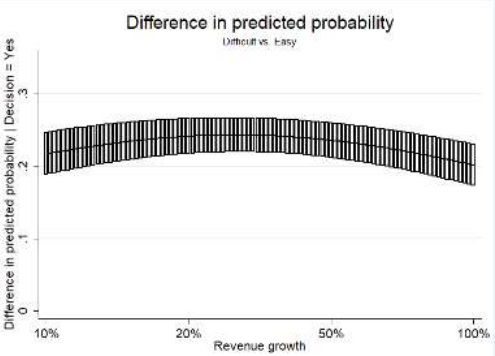
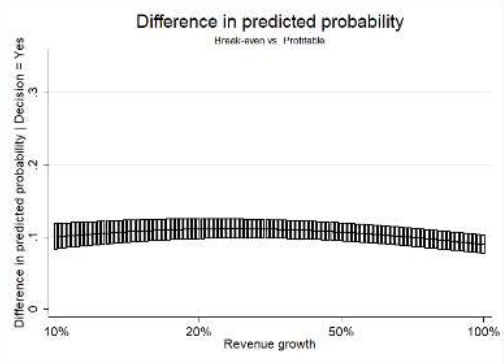
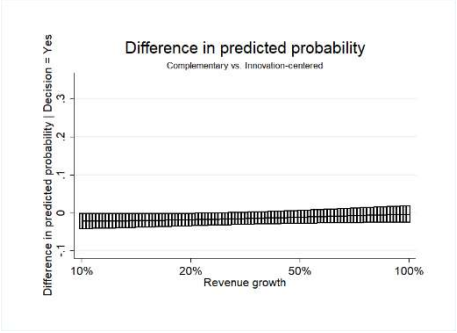
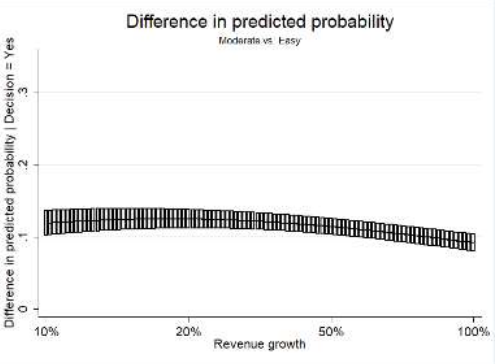
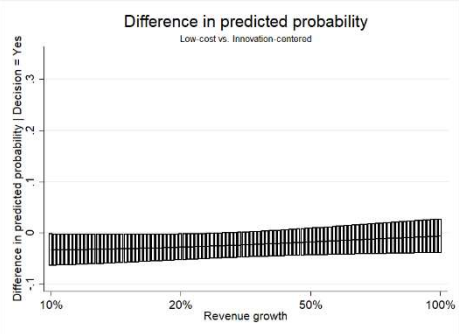
Revenue growth X Management team (track record)	*Revenue growth X Value-added of product / service*	*Revenue growth X Current investors*
		
		

Table continued on the next page

Revenue growth X Profitability	*Revenue growth X Business model*	*Revenue growth X int. scalability*
		
		
		

Note: N=749; Displayed are differences in predicted probabilities based on Zelner (2009) based on different values of the interaction using 500,000 random draws. The slope of the curve indicates if the difference in predicted probability is increasing (e.g. increasing slope) or decreasing (e.g. decreasing slope) for different values of the interaction. If the confidence intervals do not cross the zero-line, it indicates that the respective two predicted probabilites are different from zero and interactions are therefore deemed statistically significant.

Following this analysis of decision-making behavior, the data shows a certain level of variation in the estimated utility measures. This might be due to some external factors (individual or investors specific characteristics) that influence the decision behavior. In order to characterize this further, this dissertation employs a clustering algorithm to identify groups of participants that share a highly similar decision behavior. Clustering is a statistical method to group objects (here: investment professionals) together that have a small distance between them (here: individuals with similar utility weights for attributes). Different distances measures (e.g. Manhattan distance or Euclidean distance) can be used as well as different algorithms to group the objects (e.g. k-means or hierarchical clustering). Following this explorative approach, cluster / groups can be identified and further described. This thesis uses a k-means (based on a squared Euclidean distance) clustering approach with four clusters on the attribute level zero-centered utility estimates from the hierarchical Bayes estimation used in figure 12.[41] The hierarchical Bayes estimation was chosen, as utility estimates can be computed on an individual participant's level (Orme, 2000).

Tab. 37: K-means clustering (squared Euclidean distance) of attribute utilities

	Cluster 1	**Cluster 2**	**Cluster 3**	**Cluster 4**	**ANOVA test**
Name of cluster	*Profitable team-based ventures*	*Revenue centered ventures*	*Product-based ventures*	*Int. growth ventures*	*One way ANOVA F-test*
Management Team	24.46	13.96	14.72	8.58	213.9***
Current revenue growth	15.28	31.37	15.05	24.09	426.2***
Current profitability	16.71	11.54	9.34	11.35	31.7***
Current Investors	7.97	8.27	7.73	6.45	6.59***
Business model	9.68	9.80	11.67	10.40	6.85***
Value-added of product	13.63	15.19	27.98	21.43	240.1***
Int. Scalability	12.23	9.82	13.46	17.66	65.7***
N	*211*	*237*	*159*	*142*	
% of sample	*28%*	*32%*	*21%*	*19%*	

*Note: Displayed is the average attribute utility in the cluster based on a hierarchical Bayes regression. ANOVA F-test determines if statistically significant differences between the means of several groups exist; *** $p < 0.001$.*

[41] Four clusters were chosen due to an employed elbow method in order to determine an appropriate number of clusters. K-means clustering algorithm is an unsupervised machine-learning algorithm that tries to partition *n* objects (e.g. individuals) into *k* groups based on a distance measure between the object to the cluster *k* with the nearest mean. The algorithm can be defined as follows: Let $X = \{x_i\}$ with *i= 1,2,3…n* a set of n (number of objects) d-dimensional (distance) points that are tried to be clustered in k clusters. K-means finds a partition, so that the squared errors between the mean of a clusters and the objects in the cluster are minimized. Here μ_k is the mean of a the cluster c_k. The squared error for one cluster k is defined as: $J(c_k) = \sum_{x_i \in c_k} \|x_i - \mu_k\|^2$. This squared error is tried to be minimized across all clusters (Jain, 2010).

Table 37 shows the result of this cluster analysis and displays the average attribute utility by cluster. As seen in Table 37, four distinctive groups were identified. The first group was named "Profitable team-based ventures". This group of investors (N=211) is mainly focusing on the management team track-record (24.46) and the profitability of the later-stage venture (16.71) in their first screening. Compared to that, the second group ("Revenue centered ventures"), relies to a high degree on the revenue growth of the later-stage venture, whereas the int. scalability and external investors only play a minor role. The third group can be characterized as product-based investors, whose main decision criteria is the value-added of the product and a rather balanced importance spread across the other attributes. The last group ("Int. growth ventures") consists of 19% of the entire sample and this group of investors mainly relies on three attributes: revenue growth, value-added of product and int. scalability of the venture. The results are confirmed by a one-way ANOVA test on the mean values of the attributes in the clusters. To further characterize the identified groups, additional variables from the survey were compared across the four groups (see Table 38).

Tab. 38: Cluster description using additional variables

	Cluster 1	**Cluster 2**	**Cluster 3**	**Cluster 4**	**ANOVA test**
Name of cluster	*Profitable team-based ventures*	*Revenue centered ventures*	*Product-based ventures*	*Int. growth ventures*	*One way ANOVA F-test*
% CVCs	9.4%	7.4%	11.0%	7.7%	0.48
% VCFs	32.7%	47.6%	49.6%	48.5%	5.26***
% Family Offices	10.0%	8.0%	8.1%	4.2%	1.30
Avg. experience as investor	12.44	10.33	9.76	11.78	4.31**
Avg. tenure	7.35	6.70	6.52	7.41	0.88
% Entrepreneurial experience	52%	47%	51%	48%	0.73
Avg. performance index	259.10	247.64	252.05	246.97	2.19†
% >10x CoC deals	4.8%	4.9%	4.3%	4.3%	0.28
N	*211*	*237*	*159*	*142*	
% of sample	*28%*	*32%*	*21%*	*19%*	

*Note: N=749. † < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001.*

As seen in Table 38, some differences between the groups can be identified. First, FOs are more than two times more present in the first cluster compared to the fourth cluster, indicating a potential greater appetite of FOs for more profitable later-stage ventures. However, the

ANOVA test does not indicate a significant difference across all groups. But, by only comparing cluster one and four, the difference appears to be statistically significant using a t-test of equality of means between the two clusters. This difference might be a result of the different goals and governance structures that FOs have compared to other investors (Wessel, 2013).

A different scenario can be assessed for CVC investors in the different clusters. In the third cluster, the biggest proportion of CVCs is present, indicating a high importance towards the product of the later-stage venture. This might be an initial hint on the more pronounced product focus of CVCs. Research shows that large enterprises often initiate CVCs in order to source external innovation for the firm (Dushnitsky & Lenox, 2005; Ernst et al., 2005). However, the ANOVA test does not indicate a significant difference across all groups. Only by comparing cluster three with cluster two or four, statistical significant differences can be identified. VCFs seem to show a greater appetite for high growth ventures that are easy to scale internationally (cluster two and four). This might be due to the structure and incentive systems in VCFs that are aiming to deliver returns to investors over a short period of time. This might incentivize to take more risky investments in order to provide high returns (Shane, 2012). The ANOVA test reveals a statistically significant differences across the four clusters.

In regards to experience and entrepreneurial background of the investors, cluster 1 shows the highest values for these variables, indicating a potential link between individual characteristics and the decision behavior. Maybe investors need to be more experienced in order to evaluate difficult to interpret signals, like the quality of the management team of a later-stage venture. In regards to the performance measures in Table 38, no statistically significant differences are identified.

This initial analysis provided in Table 38, provides initial hints of potential reasons for different decision behavior. However, this analysis is by far not enough to draw conclusions from the data. Further analysis is needed. Overall, I provide evidence as to which decision criteria are used in the screening process. Conducting a conjoint experiment, I find that investors particularly focus on (1) revenue growth, (2) added value of product/service, and (3) management track record. This process is followed by decision criteria, such as profitability and international scalability, while the type of existing investors and the design of the business model are of minor importance. These empirical insights are of particular importance for entrepreneurs seeking growth financing, as they can provide guidance on the most relevant attributes risk capital investors are going to evaluate. This outcome is especially important for later-stage ventures, where investment volumes often surpass those of earlier stages. In contrast to previous

studies, findings show that in the context of later-stage ventures, the management team is not the most important decision criteria to investors. Financial and product characteristics seem to play a bigger role in later stages of venture development. I argue that the lower importance of the management team stems from the fact that early-stage ventures and later-stage ventures have different risks, goals, and characteristics (Rhunka & Young, 1987). In particular, the management team's track record signals quality so that the risk of success is associated with the management team and the reputation of prior investors. However, when financial figures become available in a later-stage context, these signals lose importance and are replaced by more tangible indicators of venture quality (Block et al., 2014).

In addition, prior research acknowledges and demonstrates the importance of reputable investors for early-stage ventures (Hsu, 2004). Interestingly, I find that the reputation of previous investors is among the least important attributes in a later-stage context. Similar to the management team attribute, the reputation of prior investors may be more important if only limited information is available on the venture. As more information emerges as the venture progresses into later-stages, this criteria is replaced by more tangible information (e.g., revenue growth). Another explanation could be that the strength of this positive signal is reduced due to anticipated conflicts of interest between existing and future investors. In particular, high reputation investors are more likely to be active and shape the portfolio venture to their own needs (Johnson & Swem, 2017). Support of this argument was also found in some of the interviews. However, this finding bears some insights for entrepreneurs as well as for risk capital providers. Entrepreneurs who communicate the existence of reputable investors can benefit from a small positive signaling effect towards future investors. The findings also show that communicating the existence of unknown investors does not have any signaling effect.

5.4 Influence of individual characteristics

5.4.1 Personal schemata and decision-making

Decisions of individuals about an object (here: later-stage ventures) cannot be understood only through the characteristics of the object, but need to be put in the context of the decision maker. Specific knowledge that investors have acquired over the years may have an impact on their decision making. Having seen ventures fail and succeed might have provided investors with rules on how to evaluate ventures in the initial screening. Here, research has shown that various types of heuristics and biases exist in the entrepreneurial decision-making process (Shepherd et al., 2015). Only a limited number of studies have focused on this topic in the field of VC decision-making research (exceptions include Franke et al., 2008).

Therefore, this dissertation relies on cognitive theory to better understand decision making of VCs when screening later-stage ventures. Cognitive research is a field that endeavors to provide insights into how our brains process information and how this influences our decision making. This research is important for psychology scholars as well as computer scientist scholars who try to develop software that imitates cognitive brain processes (referred to as artificial intelligence research). One particularly important aspect of cognitive research is the concept of "schemata." Schemata theory, which is a cognitive theory, states that all knowledge possessed and acquired by humans is organized in units (Rumelhart, 1980) and various information is stored in these units of knowledge. Based on this concept, units of knowledge include a network of skills, facts, events, action sequences, or situations (Gagné & Glaser, 1987; Fiske & Taylor, 1991; Van Merrienboer & Sweller, 2005). To illustrate this concept further, one can use the following analogy. Consider a schemata or unit of knowledge about universities. Within that schemata, individuals have acquired and possess knowledge about universities (e.g., educational institutions, education titles, professors, student parties, and others) in the form of facts, but this knowledge may also include events or experiences that they associate with universities (e.g., first student party attended, hard exams, boring teachers, and others).

One important concept from this theory is how people build these schemata/units of knowledge, which leads to the concept of learning. Learning can be understood as a set of procedures in our brains for processing information (Gagné & Glaser, 1987). If people receive a stimulus from their environment (e.g., listening to the sound of birds, reading a book, or talking to a friend), it is transformed by human receptors into patterns that can be understood as infor-

mation or knowledge (Garner, 1962), creating learning schemata. This means that an individual's schemata can be adjusted over time in various ways. It is important to understand that these schemata have a significant effect on how we behave and, in the context of this research, on how we make decisions. Here, the experiences individuals have play a key role. Two quotes illustrate this:

> *"Depending upon your personal experience, the knowledge of a dog as a pet (domesticated and loyal) or as an animal to fear (likely to bite or attack) may be a part of your schema."*
>
> *[Rumelhart, 1980, p.1]*

> *"Expertise develops as learners mindfully combine simple ideas into more complex ones. A chess expert, for example, combines simple ideas about the best positioning of individual pieces to develop complex schemata of how several chess pieces should be positioned concomitantly. These schemata organize and store knowledge, but also heavily reduce working memory load because even a highly complex schema can be dealt with as one element in working memory."*
>
> *[Van Merrienboer & Sweller, 2005, p.149]*

Studies find that experienced individuals, that is, individuals who have performed a particular task multiple times over a long period of time, possess more granular, detailed, connected, and complete schemata than others (Lurigio & Carroll, 1985; Knowlton, 1997; Matlin, 2005). Some studies therefore argue that different levels of experience do not lead to faster decisions, but rather that more experienced individuals have learned to recognize the meaning of certain patterns compared to others. This is illustrated by the following quote from Prietula and Simon (1989):

> *"In fact, the veteran does not scan the environment and process information any faster than the inexperienced foreman; rather, he (or she) has learned to grasp the meaning of certain patterns of operations and activity on the plant floor. In a sense, the foreman does not need to think about this information; he simply reacts to it."*
>
> *[Prietula & Simon, 1989, p.121]*

These arguments have also been applied in the context of decision making by VCs (Shephard, 2003; Franke et al., 2006). For this dissertation, this means that investors with prior investing or entrepreneurial experience might be more knowledgeable about which later-stage venture characteristics are required for a venture to develop into a successful firm. Entrepreneurial experience is of particular interest, as past studies show that entrepreneurial experience can affect individual behavior and knowledge through the learning achieved during the time

spent as an entrepreneur (e.g., Ucbasaran et al., 2003a; Ucbasaran et al., 2003b; Franke et al., 2008; Ucbasaran et al., 2010; Farmer et al., 2011; Shepherd et al., 2015). A quote from Stuart & Abetti from 1990 illustrates this:

> *"The best way to learn about making a company successful is to work in, or better to run a new firm"*
>
> *[Stuart & Abetti, 1990, p.151]*

Moreover, experience as an investor might create unique schemata. Being an investor for a long time provides chances to see many investment opportunities and follow many entrepreneurial ventures along the way. That being said, experienced investors might possess more complete and domain-specific schemata than novice entrepreneurs who have been exposed to only a few investment opportunities.

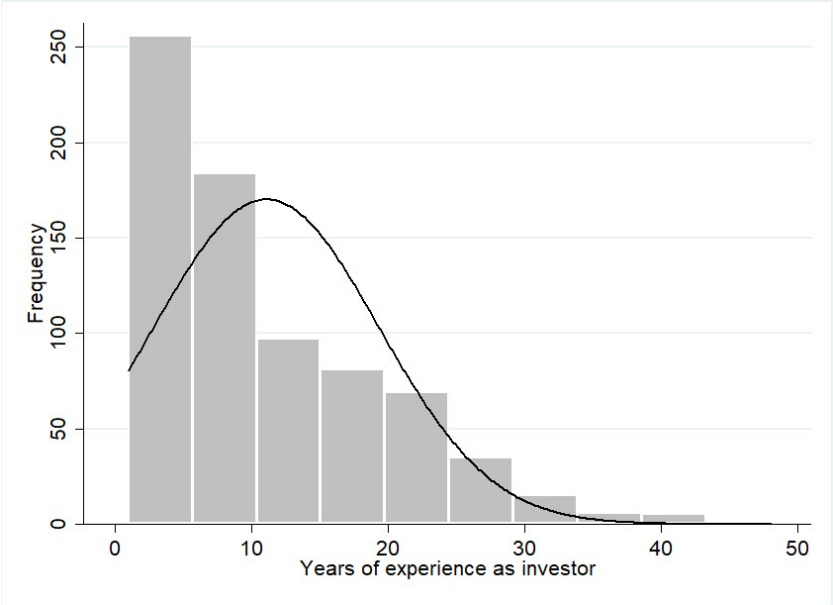
Moreover, initial knowledge of the presence of such effects on decision making would be important to the research community for building additional theory about VC decision making in general and in the context of later-stage ventures. This might mean that, in addition to institutional characteristics (see section 5.5), scholars need to also take individual characteristics into account when assessing VCs' decision making. Based on this, it can be assumed that individual schemata shaped by investment experience, entrepreneurial experience, or leadership experience can influence individual decision behavior. Therefore, this dissertation addresses the following exploratory research question: *How do individual schemata influence the decision making of VCs in the context of later-stage ventures?* The following characteristics are assessed:

- *Entrepreneurial background*: How does entrepreneurial background shape decision making of VCs in screening later-stage ventures? – Q1
- *Serial entrepreneurial background:* How does serial entrepreneurship shape decision making of VCs in screening later-stage ventures? – Q2
- *Investment experience:* How does investment experience shape decision making of VCs in screening later-stage ventures? – Q3
- *Work experience*: How does work experience (e.g., working for start-ups in the past) shape decision making of VCs in screening later-stage ventures? – Q4

5.4.2 Descriptive analysis

Descriptive statistics are calculated to obtain first insights on the questions stated in section 5.4.1. Starting with the experience of individuals as investors (in years), Figure 15 displays the distribution of experience among the respondents (variable: *experience as investor* in Table 34). As seen in this figure, experience is skewed towards individuals with less than 10 years of experience, while the mean is slightly above 10 years. The figure also shows a strong variance in the experience that individuals have, ranging from as low as one year to as high as 48 years.[42] This variable is also correlated with the position in the firm. Highly experienced individuals tend to hold partner positions, whereas novice individuals are often analysts or junior associates in investment firms.

Fig. 15: Years of experience as investor



Source: Own illustration based on data from 749 participants.

The tenure of investors (variable: *tenure* in Table 34) with their current firm shows a very similar distribution as *experience as investor*. Looking at the entrepreneurial experience that participants in the sample have, the data shows a nearly 50/50 split of investors with entrepreneurial experience and individuals with no entrepreneurial experience. Table 39 shows the distribution of this variable in the sample and its frequencies.

[42] Figure A17 in the appendix displays a logarithmic form of this variable, showing a nearly normal distribution.

Tab. 39: Entrepreneurial experience

Entrepreneurial experience	N	%
No	369	49.27
Yes	380	50.73

Next to this, investors in the sample not only have founded one company, but can often be considered "serial entrepreneurs." As seen in Table 40, the majority of participants have founded one firm, but a fraction of individuals have had multiple ventures in the past. The average is close to two ventures.

Tab. 40: Serial entrepreneur (# ventures founded)

Entrepreneurial experience	N	%
1	166	43.83
2	98	25.72
3	57	14.96
4	19	4.99
5	16	4.20
6	5	1.31
7	3	0.79
8	2	0.52
9	0	0.00
>10	14	3.67

N=380[43]

Interestingly, past work experience also differs quite significantly between participants. Looking at Table 41, the data shows an almost even proportion among the levels of past work experience (variable: *Leadership experience (mostly in startups or SMEs)*, *Leadership experience (working in large firms & startups or SMEs)*, and *Leadership experience (mostly in large firms)* in Table 34).

Tab. 41: Working experience of participants

Working experience	N	%
Mostly working for start-ups/SMEs	200	26.70
Working for large firms & start-ups/SME	289	38.58
Mostly working for large firms	260	34.71

[43] Figure A18 in the appendix displays the distribution graphically.

5.4.3 Results

To address the research questions formulated in section 5.4.1, this study employs a multi-level logit regression model with interaction terms to understand the effect of various types of experience and entrepreneurial backgrounds on the attribute levels, in line with the approach described in section 5.3.

To evaluate the significance and direction of various interactions, a multi-level logit model is first estimated and then additional analysis is executed, similar to the analysis of interactions in section 5.3 (using the Zelner (2009) approach). The results are displayed in Table 42. The first column (*Q1*) displays the summarized results of interaction effects between attributes and the variable *entrepreneurial experience* from Table 34. Column 2 (*Q2*) does the same for the variable *serial entrepreneur* from Table 34, while column 3 (*Q3*) summarizes the interaction with the variable *experience as investor*, and column 4 (*Q4*) considers the interaction with the variable work experience, displayed in Table 41. Table 42 presents the results in a summarized and simplified manner. First, a minus (plus) indicates a significantly negative (positive) interaction with the interacted variable (in this case, entrepreneurial experience, serial entrepreneurs, investor experience, and work experience), based on the regression coefficients and respective statistical tests.[44] Additional tests were executed to validate the results (one via marginal effects, the other via Zelner's simulation-based approach, as discussed in section 5.3). In other words, a negative sign indicates that a change in the respective measure (e.g., from non-entrepreneurial experience to entrepreneurial experience) reduces the weight of the attribute in the table.

Regarding the first question on the effect of entrepreneurial experience, I find the following. As seen in Table 42, entrepreneurs seem to have different weighting associated with the business model of a later-stage venture. The interacted variable is coded as a dummy variable (1=entrepreneurial experience; 0= no entrepreneurial experience). Investors with entrepreneurial background place significantly less importance on lock-in business models than their counterparts. Investors with non-entrepreneurial backgrounds put significantly less importance on low-cost business models than their counterparts. Both results are significant at least at the 5% level.[45]

[44] Investors experience is coded as a dummy (1=above-median experience; 0 = below median experience) for this analysis.

[45] To simplify the table, the results at the attribute level basis are not displayed.

In addition, the results provide interesting answers to Q2. There is a significant difference in estimated utility for serial entrepreneurs compared to one-time founders. Serial entrepreneurs place significantly less importance on profitable later-stage ventures, high-growth ventures, and ventures with high value-added products or services.

Past investment experience seems to shape individual decision behavior as well. Individuals with above-median experience place significantly greater importance on the track record of management compared to novice investors (significant at the 5% level). Furthermore, investors with above-median experience showed more appetite for low-cost business models and less appetite for lock-in business models than novice investors. The results are significant at the 1% level.

Almost none of the interactions regarding Q4 were significant. Work background had a small effect on evaluation of the value-added of products or services. Here, participants with primarily corporate backgrounds placed significantly more importance on high value-added products or services of later-stage ventures. However, the effect is significant only at the 10% level.[46]

Tab. 42: Interaction effects - individual schemata

	Q1: Entrepreneurial experience *(ref. no-entrepreneurial experience)*	Q2: Serial entrepreneurs *(ref. one-time founder)*	Q3: Investment experience *(ref. below median experience)*	Q4: Working experience *(ref. mostly working for start-ups)*
Management Team	/	/	+*	/
Support by marginal effects			*Yes*	
Support by Zelner (2009)			*Yes*	
Revenue growth	/	-*	/	/
Support by marginal effects		*Yes*		
Support by Zelner (2009)		*Yes*		
Profitability	/	-*	/	/
Support by marginal effects		*Yes*		
Support by Zelner (2009)		*Yes*		
Current Investors	/	/	/	/
Support by marginal effects				
Support by Zelner (2009)				
Business model	-**	/	-**	

[46] In addition to these results, exploratory results of different investor groups for this hypothesis showed similar, but sometimes different, results.

Support by marginal effects	*Yes*		*Yes*	
Support by Zelner (2009)	*Yes*		*Yes*	
Value-Added	/	-**	/	+⁺
Support by marginal effects		*Yes*		*Yes*
Support by Zelner (2009)		*Yes*		*Yes*
Int. Scalability	/	/	/	/
Support by marginal effects				
Support by Zelner (2009)				

Note: N=749; For Q2: N=380.

These results shed first light into how individual schemata can shape decision behavior. First, the results contribute to entrepreneurial finance literature by emphasizing the need to not only evaluate venture characteristics when assessing decision making, but to also consider the characteristics of the decision-maker. Past research has, however, in many cases neglected these effects (an exception, for example, is Franke et al., 2008) and thereby limited the generalizability of the results. Second, the results of this section have shown very diverse results in terms of how individual schemata influence decision criteria weighting. It is surprising that only a few effects exist, as cognitive theory suggests that decision behavior is significantly influenced by different schemata (e.g., knowledge, skills, or experience). For example, former entrepreneurs possess very different schemata than investors with no entrepreneurial background. However, this seems to have limited influence on decision criteria weighting. This is in accordance with the initial research done by Franke et al. (2008), who also show only a limited impact of experience on the evaluation of team characteristics of early-stage ventures. To some degree, the results therefore challenge whether cognitive theory can explain heterogeneity in decision-criteria weighting regarding the screening of later-stage ventures.

However, the results also indicate that the weighting attributed to product and business model characteristics is particularly significantly influenced by investment and entrepreneurial experience. Future research needs to further evaluate such potential influences on the decision making of VCs. This is very important, as past research has already highlighted sources of bias in VCs' decision making (Murray & Lott, 1995; Zacharakis & Shepherd, 2001; Parhankangas & Hellström, 2007; Franke et al., 2008; Cumming & Daum, 2010).

5.5 Influence of investor characteristics

5.5.1 Family offices[47]

Much research has been conducted on the decision-making of equity investors, such as VCFs and business angels (e.g., Tyebjee & Bruno 1984; Franke et al., 2008; Hsu et al., 2014; Barrot, 2016; Warnick et al., 2018 – see chapter 2.2). Recently, FOs have become an increasingly important player in the market for entrepreneurial finance (Ford & Nelsen, 2014; Block et al., 2018). Yet, so far, little is known about their decision-making criteria regarding their investments in entrepreneurial ventures. Supporting this assertion, recent practitioners' reports show that while the fraction of investments by FOs in real estate have decreased over the last decade, direct equity investments have almost doubled (Bloomberg, 2014; Rowley, 2018). Coherently, a survey by the Family Office Exchange finds that, in 2016, 96 out of 118 US FOs reported having at least one full-time employee sourcing and evaluating direct equity investments (Family Office Exchange, 2017). Considering that the 50 largest family offices account for assets under management of approximately USD 1,000 billion (Bloomberg 2014), research on the assessment of entrepreneurial ventures by FOs is both highly timely and relevant. To date, the entrepreneurial finance literature has largely neglected this increasingly important class of investors. This part of the dissertation sheds light on FOs by comparing their decision-making criteria regarding investments in later-stage ventures with those of VCFs.

There are at least three reasons why the screening criteria of FOs might differ from those of VCFs. First, their goals differ; in addition to financial goals, FOs pursue non-financial goals such as perpetuating family values and the family dynasty (e.g., Chrisman et al., 2004; Chrisman et al., 2012; Wessel, 2013; Williams et al., 2018). Second, their investment horizons differ; FOs typically have longer-term durations than other private equity funds, as they aim for capital preservation instead of short-term returns on investments (Gomez-Mejia et al., 2007; Lumpkin et al., 2010). Third, their agency and fund-raising structures differ; unlike VCFs, FOs do not raise funds from a multitude of external funding sources but, rather, raise funds from one or a few families only (Wessel, 2013; Ford & Nelsen, 2014; Wessel et al., 2014). Based on these differences between FOs and VCFs, I hypothesize that FOs assess entrepreneurial ventures differently than VCFs and hypothesize that their assessments differ with regard to the importance of several pertinent criteria. In particular, I argue that FOs attribute greater importance to the

[47] This section of the dissertation is part of a joint research paper with Jörn Block (University Trier), Silvio Vismara (University Bergamo) and Christian Fisch (University Trier).

current profitability of the entrepreneurial venture but attribute less importance to the revenue growth of the entrepreneurial venture. Additionally, I argue that the investment decisions of FOs vs. VCFs differ with regard to the involvement of other investors. Specifically, FOs should attribute less importance to the presence of other investors in general and reputable investors in particular. The following sections provides arguments for these questions and explain the approach of how they were empirically investigated.

5.5.1.1 Theory

FOs are organizations that manage the wealth of business families by taking actions (i.e., investments) to sustain and grow their wealth (Gilding, 2005; Gray, 2005; Berent-Braun & Uhlaner, 2012; Ford & Nelsen, 2014). Prominent examples of FOs include Horizons Ventures, the Hong-Kong based FO of the Kashing family, or Madrone Capital Partners, the US-based FO of the Walton family (Walmart). Despite their economic relevance and long history, accessing information about FOs is difficult for both researchers and market participants because FOs are not required to disclose information about their investments (Amit & Lichtenstein, 2009). Recent studies have shed some light on the structures and goals of FOs (Wessel et al., 2014; Zellweger & Kammerlander, 2015), but we still do not know how these particularities translate into investment preferences.

Because VCFs are the dominant equity investors in entrepreneurial ventures, most of the extant literature focuses on VCFs when studying decision-making in entrepreneurial finance (e.g., Shepherd, 1999; Shepherd & Zacharakis 1999; Franke et al., 2008; Warnick et al., 2018). However, there are a number of differences between FOs and VCFs that I summarize in Table 43.[48] First, FOs reflect the specificities of their partners. Relative to other investors, the goals of the controlling families often extend beyond financial objectives (Chrisman et al., 2012; Wessel et al., 2014; Williams et al., 2018). Prior research often refers to the concept of socio-emotional wealth to identify a pool of non-financial aspects of the firm that meet the family's social and affective needs, including the ability to exercise family control and influence, fulfill desires for belonging and identity, act altruistically toward family members, and perpetuate family values and dynasty (Gomez-Mejia et al., 2011). The setting of non-financial goals is therefore among the distinctive aspects of FOs (Wessel, 2013; Zellweger et al., 2013), whereas

[48] In this study I mainly treat family offices as a homogenous group. I explore differences within the group of family offices in the robustness checks later in this chapter.

financial returns are the main (and often only) aim of VCFs and the investors behind them (e.g., Robbie et al., 1997; Manigart et al., 2002).

Tab. 43: Characteristics of FOs and VCFs

Characteristics	FO	VCF
Goals	Financial and non-financial	Financial
Risk-aversion	Higher	Lower
Time horizon	Longer (no restrictions)	Shorter (predetermined)
Limited partners	Family members	Multiple and diverse external partners
Relationship partners-managers	Long-standing	Short-term
Control mechanisms	Mix of formal and informal	Mainly outcome-based (formal)
Array of activities	Support for the family	Pure investment

Additionally, financial goals are likely to be different for FOs relative to other investors. While return on investments is important, it is intermingled with wealth preservation objectives in FOs. Indeed, FOs have the mission to protect and preserve assets for future generations. Indeed, a survey by Bloomberg (2017) finds that the main objective of FOs is intergenerational wealth management. From a risk-return perspective, this objective suggests that FOs are less willing to accept more risk for the possibility of higher returns. This, again, reflects the higher risk-aversion of families as investors relative to other private investors such as VCFs. Similarly, and consequential to the pursuit also of non-financial goals, the long-term sustainability orientation and the generational thinking of families (Le Breton-Miller & Miller, 2006) are transmitted into FOs and manifests itself in longer investment horizons (Ford & Nelsen, 2014). While VCFs structure their funds with a predetermined investment time horizon and a clear exit intention (Gompers & Lerner, 2001), FOs do not necessitate a rapid exit strategy. The non-purely financial and long-term orientation, together with the cautious risk-taking behavior of FOs are likely to have impact on their investment decisions in entrepreneurial ventures.

As a result of these goal differences, the structure of FOs is largely different from that of VCFs. Managers of FOs deal with only one type of limited partner (i.e., family members). This is a distinctive difference to managers of VCFs, who raise capital from multiple and diverse external limited partners. Often, VCFs set a minimum investment level, in order to limit the number of external partners committed to the fund, and to thus minimize the time spent in investor relations (Gompers & Lerner, 2001). This higher degree of distance between general partners (managers) and limited partners, together with a predetermined maturity of their funds, forces VCFs to handle the uncertainty of their investments with a specific design of contracts with entrepreneurs and important employees (contracting), and the continuous control of the

investee firms (monitoring). The latter is established by setting funding milestones and by a periodical formal reporting accompanied by audits and meetings to evaluate results. To this extent, VCFs are necessarily oriented towards outcome control mechanisms (e.g., carried interest on the performance of the fund). In contrast, FOs deal with a less formal type of investor. The absence of fund raising activities allows for less formal monitoring and reporting processes to give account to the capital providers. FOs can use both formal (e.g., behavior- and outcome control mechanisms) and informal control mechanisms (e.g., social or relational controls, norms or values) to ensure goal compliance (Wessel et al., 2014). These different sets of control and governance mechanisms should have an impact on the decision-making of FOs and VCFs.

Lastly, while VCFs mainly make investment decisions, the array of activities of FOs is broader, including the provision of tailored services for family members (Decker & Guenther, 2016). These activities vary from the consolidation function of accounting, tax and estate planning, to transgenerational planning and concierge services such as organizing family meetings and communication or providing financial education (lifestyle enhancement) to the family's new generation.

This study relies on the conceptual model from chapter 2.1.2 and a combination of signaling and agency theory in order to derive hypothesis on the decision-making behavior of FOs and VCFs. The most widespread organizational structure used in VCFs and, more broadly, in private equity investing is the limited partnership. In these structures, limited partners (principals) invest money in funds which are actively managed by general partners (agents). The latter have better information than principals over the fund's activities, performance, and their own effort and talent. This is the typical agency relationship with potential adverse selection and moral hazard problems arising from hidden information and hidden action. Similar to VCFs, FOs also employ external management with the investment decision task. Principal-agents problems, therefore, concerns also FOs, although to a lesser extent as compared to VCFs.

Different to VCFs, however, FOs raise money from one or few families. FOs are not registered as investment advisers, thereby being allowed to keep a higher level of secrecy (Bloomberg, 2014). This specificity forbids them to advertise or provide investment services to investors. This means that in FOs agents deal with one or a few principals, thereby facing different prospects of principal-principal problems as compared to when dealing with many short-term private equity investors. Accordingly, control mechanisms in VCFs are typically outcome-based, whereas FOs employ a mix of formal and informal mechanisms. Informal control,

which induce self-regulation through trust, mitigates indeed the risk of value appropriation in long-term relationship (Eisenhardt, 1985; Ouchi, 1979).

As mentioned above, where VCFs and FOs differ the most is perhaps in their goals and horizons. While VCFs are organized in different funds with a definite horizon, investors in FOs rarely change over time. Their pursuit of (also) non-financial goals and generational thinking also impact on the agency relationship with the money managers. This relatively long-term and less purely finance orientation of FOs is likely to impact on the investment decision-making, as I argument in more detail below.

5.5.1.2 Hypothesis

Profitability

FOs, whose goals are determined by the families to which they belong, are often conservative and risk averse (Wessel at al., 2014). By undertaking risky decisions, managers of FOs risk losing the family wealth and jeopardize the financial and social wellbeing of future family generations. They are therefore more concerned about the conservation of irreplaceable capital, often accumulated over generations, rather than on potential high returns. For this reason, I expect FOs to be more reluctant than other providers of entrepreneurial finance in pursuing high-risk investments. As entrepreneurial ventures with poor profitability are associated with a high risk of bankruptcy (Agarwal & Taffler, 2008), FOs will consider such ventures as high risk investments and will therefore stay away from such investments.

In contrast, VCFs need to deliver returns to their partners over a relatively short period of time. This incentivizes them to take more risky investments. The short investment horizon of VCFs and their investors behind exacerbate the short-termism of fund managers (Laverty, 1996), who are asked by capital providers to provide high returns (Shane, 2012). Everything else equal, high returns are more difficult to achieve in already profitable firms, whereas the higher risk of entrepreneurial ventures is associated with higher chances of high growth rates. As a consequence, managers of VCFs tend to focus on future growth potential instead of current performance, thereby considering also entrepreneurial firms with low profitability and high growth as attractive investment targets (Puri & Zarutskie, 2012).

In addition, the incentives set by principals to VCF managers to select investments with the potential to generate high returns are paralleled at the individual level. Similar to mutual fund managers, their professional identity stems from their reputation in the market, which is

to a large degree gained and sustained through their investment track record (Chevalier & Ellison, 1999; Kempf & Ruenzi, 2007). Fund managers that do not provide high returns to their investors will find it hard to secure further funding and suffer from a reduced labor market value. Beside monetary returns, other motivations for VCF managers involve status and desire to outcompete their peers. These motivations are reflected in the characteristics of the entrepreneurial ventures that they seek. A firm with a high current profitability does not represent the ideal setting where to possibly outperform and gain popularity as a fund manager.

In sum, I argue that FOs should have a higher preference than VCFs for entrepreneurial ventures and investment opportunities with high profitability. I hypothesize:

> ***H1:*** *Compared to VCFs, FOs attribute a higher importance to the current profitability of the entrepreneurial venture.*

Revenue growth

VC financing is characterized by little collaterals, high growth, and high risk (Ueda, 2004). In general, FOs are not as resourceful and as experienced in investing in entrepreneurial ventures as VCFs. From a resource-based perspective, FOs are thus disadvantaged when it comes to monitoring and providing support to the ventures they invest in. This is particularly relevant in the case of high-growth entrepreneurial ventures. Monitoring and supporting high-growth ventures is typically very challenging and resource-intensive. Also, while the current profitability reflects an investment associated with lower risk, high growth potentially incurs uncertainty, as it exposes entrepreneurial ventures to additional challenges and risks (e.g., from entering new markets and hiring new employees) (Perez-Quiros & Timmermann, 2000). Risk aversion in conjunction with limited resources might lead FOs to avoid preferring high-growth firms as investment targets.

In contrast, VCFs are known for their preference for high-growth ventures. Again, a reason is the high expected rate of return on its investments over a comparatively short period of time. This requires that at least some ventures in the investment portfolio promise high growth (Davila et al., 2003). The structure of VCFs is typically designed to achieve such goals. The control mechanisms are mainly outcome-based and are achieved through the continuous monitoring of the portfolio companies. Different from FOs, the agency problem in the VC investor-entrepreneur dyad is plagued by information asymmetries, but also by possible goal conflicts,

if the VC's short-term orientation does not match with the ambition of long-term success of portfolio entrepreneurs.

VCFs provide their portfolio firms with a complex bundle of value-adding resources and activities (e.g., Hellmann & Puri, 2000; Hellmann & Puri, 2002; Cumming et al., 2005; Ter Wal et al., 2016), which include coaching activities, strategy and management support as well as network access. . These resources are especially needed in young entrepreneurial ventures operating in high-growth industries that typically lack profitability but promise high revenue growth. The process, however, also requires high levels of human capital which is able to provide high-quality, value-adding services. Coherently, most VCFs have extensive and successful own business experience (Sorenson & Stuart, 2001). For this reason, they supposedly have higher capabilities to deal with high-growth ventures than managers of FOs. To summarize the arguments, I expect that FOs have a lower preference for high growth ventures than VCFs. Therefore, I hypothesize that:

> ***H2:*** *Compared to VCFs, FOs attribute a lower importance to the revenue growth of the entrepreneurial venture.*

Current investors

The structure of many FOs is not large enough for them to be able to devote considerable resources to systematically screening and monitoring entrepreneurial ventures. If they do the whole process on their own, they end up screening only a small set of investment opportunities. Since they often do not have enough competent staff dedicated to own deal origination, co-investments and syndication become more attractive to FOs. By co-investing with other investors, they gain access to a broad set of investment opportunities. Additionally, investment partners can provide additional knowledge on an investment target during due diligence, thereby improving the overall quality of the final investment decision and preventing adverse selection.

However, syndication and the presence of other investors can generate severe conflicts of interest and agency problems. For example, freeriding behavior can occur, incurring costs to monitor or sanction opportunistic behavior (De Clerq & Dimov, 2008). These costs typically increase with the number of parties involved (Manigart et al., 2006). However, even with goal alignment between the syndication partners and without agency conflicts, there is often a high need for coordination between the syndication partners and a higher likelihood of complications, difficult negotiations, and delays in decision-making. (Fried & Hisrich, 1995; Wright &

Lockett, 2003). Such coordination costs, therefore, might discourage investments in ventures which already have some external investors.

I argue that, relative to VCFs, FOs are likely to put more weight on these costs. As described above, FOs do not only have financial but also non-financial goals. This makes goal alignment and coordination within the syndicate more difficult. Moreover, unlike VCFs (which have experience and are used to deal with different limited partners with different goals) FOs do not have the knowledge and experience in working together with other investors. I argue that in order to keep their highly efficient agency structure and preserve family harmony and family cohesion, FOs will try to avoid co-investments and forming syndicates with other investors. Hence, I hypothesize:

> ***H3a:*** *Compared to VCFs, FOs attribute a lower importance to the presence of other investors.*

When making decisions with imperfect information, individuals tend to rely on the behavior of others. Psychologists call the influence resulting from processing of information gained by observing others observational learning (Bandura, 1977). Drawing from the sociological evidence that ties to reputable actors enhance prestige (Podolny, 1993), third-party endorsements have received considerable attention as signals certifying firm quality to uninformed external investors (Hsu, 2004; Hochberg et al., 2007). The underlying idea is that prestigious players highly value their reputation and will carefully avoid tarnishing it by being connected with low-quality IPO firms. In the context of entrepreneurial finance, in the absence of credible information about ventures, investors can rely on the reputation of a company's associates to judge their quality (e.g., Nahata, 2008). In later-stage investments, an important investment decision criteria is the reputation of investors already invested in the venture.

In contrast to VCFs, FOs are expected to be reluctant to partner with prominent investors, for the arguments discussed in the previous section. In particular, I argue that the costs associated with co-investing are higher for FOs in the presence of a reputable investor. For example, co-investing generally leads to a higher likelihood of difficult negotiations between the parties involved (Fried & Hisrich, 1995; Wright & Lockett, 2003). If the co-investing party is a reputable investor, the FO will have a weaker negotiation position which discourages co-investing. Also, it is more difficult for a FO to sanction the opportunistic behavior of a reputable investor compared to more unknown investors.

In addition, high reputation investors are more likely to be active and shape the target venture (Johnson & Swem, 2017) and introduce high-growth policies in order to accelerate faster public markets that are incoherent with the capital preservation goals of FOs. Second, reputable investors are more likely to be listened to by the management. This is likely to exacerbate the principal-agent agency problem and also conflicts the goals of FOs. Therefore, I hypothesize:

> ***H3b:*** *Compared to VCFs, FOs attribute a lower importance to the presence of reputable current investors.*

5.5.1.3 PSM & analysis

In this part of the dissertation, I aim to confront the investment preferences of FOs with those of VCFs. In order to control for selection effects of participants in FOs and therefore a risk of biased treatment effects on the decision-making, this study uses propensity score matching. Prior to executing propensity score matching, potential covariates that are statistically significantly different in both groups (FOs and VCFs) are identified using t-tests for equality of mean or proportions (depending on scale of the variable). If statistical significant differences are found, selection effect can be present (Rosenbaum & Rubin, 1985). Table 44 shows the results of t-tests on several decision-maker characteristics between both groups of investors. Only covariates on the individual level of the decision maker are chosen for the t-tests, as this study wants to control for selection of individuals in these investor types. As seen in Table 44, statistically significant differences can be found for several covariates. Based on this table, individuals in the sample of FOs have significant longer experience as an investor and have significant more frequent an education background in business or economics. On the other hand, they have significant less frequent an education background in engineering, hold less board seats and have less frequent a balanced leadership background of working in large firms & startups or SMEs. Based on these results, a propensity score matching is performed.

Tab. 44: Differences between FOs vs. VCFs before PSM

Variable	**FOs** *N=59*	**VCFs** *N=330*	**Δ between both and significance test**[a]
Gender	0.898	0.873	-0.025
Age	3.440	3.269	-0.170
Experience as investor	13.474	10.051	-3.423**
Tenure	8.152	6.678	-1.473
Educational background (law)	0.101	0.057	-0.044
Educational background (business or economics)	0.864	0.727	-0.137*

Educational background (natural science)	0.084	0.130	0.045
Educational background (engineering)	0.169	0.293	0.124*
Entrepreneurial experience	0.509	0.587	0.079
Board seats	3.423	3.972	0.548*
Position in the firm	1.881	1.806	-0.075
Leadership experience (mostly in startups or SMEs)	0.389	0.315	-0.074
Leadership experience (working in large firms & startups or SMEs)	0.237	0.409	0.171*
Leadership experience (mostly in large firms)	0.372	0.275	-0.097

Notes: [a]=t-test for equality of mean (ratio scaled variable) and t-test for equality of proportions (non-ratio scaled variables); (p < 0.05, ** p < 0.01, *** p < 0.001)*

This study uses a k-nearest neighbors (KNN) matching algorithm in order to perform the propensity score matching. Using a KNN matching algorithm, an individual from the comparison group (in this case: VCF) is matched with a counterpart form the treated group (in this case: FO) that is the closets in terms of the calculated propensity scores (Caliendo & Kopeinig, 2008). The propensity scores are estimated using a logit regression where the depended variable is a binary variable (1=FO; 0=VCF) and uses all covariates form Table 44. The estimated propensity scores can then be matched with similar propensity scores. As suggested by other scholars, this study uses a one-to-many nearest neighbor matching (so called "oversampling") in order not to through away participants from the control group that have a marginally higher or lower propensity score than the already matched pair (Smith, 1997; Caliendo & Kopeinig, 2008). Within this study the number of matched neighbors is set to five.

Tab. 45: Differences between FOs vs. VCFs after PSM

Variable	**Family Office** *N=59*	**VC** *N=132*	**Δ between both and significance test[a]**
Gender	0.898	0.856	-0.042
Age	3.440	3.242	-0.198
Experience as investor	13.474	10.925	-2.549
Tenure	8.152	7.083	-1.069
Educational background (law)	0.101	0.068	-0.033
Educational background (business or economics)	0.864	0.833	-0.031
Educational background (natural science)	0.084	0.083	-0.001
Educational background (engineering)	0.169	0.159	-0.010
Entrepreneurial experience	0.509	0.545	0.036
Board seats	3.423	3.757	0.334
Position in the firm	1.881	1.901	0.020
Leadership experience (mostly in startups or SMEs)	0.389	0.371	-0.018
Leadership experience (working in large firms & startups or SMEs)	0.237	0.287	0.050
Leadership experience (mostly in large firms)	0.372	0.340	-0.032

Notes: [a]=t-test for equality of mean (ratio scaled variable) and t-test for equality of proportions (non-ratio scaled variables); (p < 0.05, ** p < 0.01, *** p < 0.001)*

The KNN matching is used in conjunction with caliper matching. The caliper matching has the purpose to minimize the risk of bad matches, if the nearest neighbor is actually far away (Dehejia & Wahba, 2002; Caliendo & Kopeinig, 2008). The result of the matching on the mean and proportion differences between the group of FOs and VCFs are shown in Table 45. As seen in this table, no statistical significant differences for the mentioned variables exist on a 5%-level between both groups after the propensity score matching.

5.5.1.4 Results

For testing the hypothesis and due to the conjoint experiment, this study uses a multi-level regression model to evaluate the strength and significance of the different signals (Brundin et al., 2008). Because the dependent variable is binary (1 = chosen; 0 = not chosen), this dissertation employs a multi-level logistic regression model. The usage of multi-level regressions is recommended if the observations are nested (i.e., the data has a hierarchical / multi-level structure) and if effects on multiple levels are evaluated at the same time (Aguinis et al., 2013; Mathieu et al., 2012). In this study, two levels exist, since multiple decisions (level one) are nested within on individual (level two) and cannot be seen as independent from each other. Table 46 presents the results of a multi-level logistics regression before and after the PSM. It displays the estimated log-odds, robust standard errors, and levels of significance of the attribute levels (main effects) as well as the hypothesized interactions terms.

The significance and direction of the interaction effects in non-linear regression models should not only be derived from the estimates presented in Table 46 (Ai & Norten, 2003). Instead, the interaction effects should also be investigated graphically and with more advanced statistical analysis. Figure 16 therefore displays the interaction effects in three ways. . Panel (a) displays the marginal effects for different values of the interaction effects (Buis, 2010). I additionally employ a simulation-based approach recommended by King et al. (2000) and Zelner (2009) to graphically investigate the interaction effects. Panel (b) illustrates the predicted probabilities for different values of the interaction based on the simulation-based approach of Zelner (2009) and King et al. (2000) using 500,000 random draws. Finally, panel (c) shows the differences in predicted probabilities between VCs and family offices at different levels of the interaction effects based on the same simulation approach.

Tab. 46: Multi-level logistic model with random intercepts and random slopes

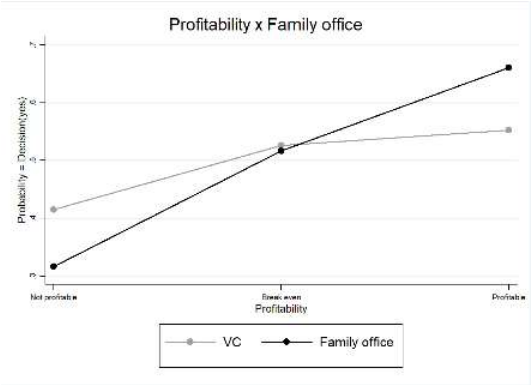
Fixed effects (log-odds)	Model 1 *(before PSM)*	Model 2 *(before PSM)*	Model 3 *(after PSM)*	Model 4 *(after PSM)*
Attributes referring to hypotheses				
Profitability (H1, ref: not profitable)				
Break even	0.456*** (0.066)	0.377*** (0.073)	0.572*** (0.095)	0.423*** (0.107)
Profitable	0.719*** (0.076)	0.582*** (0.081)	0.862*** (0.115)	0.573*** (0.133)
Revenue growth (H2, Ref: 10%)				
20%	0.539*** (0.073)	0.552*** (0.082)	0.520*** (0.107)	0.549*** (0.133)
50%	1.229*** (0.089)	1.326*** (0.097)	1.073*** (0.125)	1.239*** (0.141)
100%	1.905*** (0.092)	2.018*** (0.102)	1.771*** (0.134)	1.976*** (0.163)
Current investor (H3, ref: no external investors)				
Ext. investors - Unfamiliar (H3a)	0.030 (0.067)	0.046 (0.074)	0.004 (0.096)	0.036 (0.113)
Ext. investors - Tier 1 (H3b)	0.589*** (0.075)	0.652*** (0.082)	0.546*** (0.104)	0.684*** (0.126)
Additional attributes as controls				
Management team (ref: no team member)				
Some team members	0.892*** (0.069)	0.882*** (0.074)	0.946*** (0.102)	0.936*** (0.122)
All team members	1.295*** (0.076)	1.327*** (0.085)	1.323*** (0.112)	1.417*** (0.141)
Business model (ref: low cost)				
Innovation-centered	0.776*** (0.080)	0.767*** (0.088)	0.810*** (0.112)	0.801*** (0.134)
Lock-in	0.690*** (0.076)	0.735*** (0.085)	0.694*** (0.103)	0.780*** (0.126)
Complementary	0.290*** (0.079)	0.288*** (0.087)	0.347** (0.113)	0.356* (0.136)
Value-added (ref: low)				
Medium	1.035*** (0.072)	1.026*** (0.080)	1.100*** (0.104)	1.098*** (0.125)
High	1.707*** (0.085)	1.708*** (0.094)	1.730*** (0.129)	1.724*** (0.161)
International scalability (ref: difficult)				
Moderate	0.646*** (0.070)	0.690*** (0.078)	0.687*** (0.102)	0.822*** (0.126)
Easy	1.110*** (0.075)	1.166*** (0.082)	1.141*** (0.109)	1.279*** (0.128)
Interactions[a]				
Profitability: Break-even × Family office		0.520** (0.187)		0.501* (0.216)
Profitability: Profitable × Family office		0.905*** (0.210)		0.947*** (0.243)
Revenue growth: 20% × Family office		-0.073 (0.208)		-0.085 (0.227)
Revenue growth: 50% × Family office		-0.609** (0.230)		-0.512† (0.290)
Revenue growth: 100% × Family office		-0.690** (0.257)		-0.629* (0.281)
Current investor: Ext. inv. - Unfamiliar × Family office		-0.137 (0.190)		-0.138 (0.214)
Current investor: Ext. inv. - Tier 1 × Family office		-0.409* (0.203)		-0.440* (0.220)
N (decisions)	10,114	10,114	4,966	4,966
N (individuals)	389	389	191	191

Notes: Robust standard errors in parentheses; † < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001; Model is calculated using random intercepts and random slopes. [a] = all interaction models include interactions for business model, management team, international scalability and value-added for control purposes.

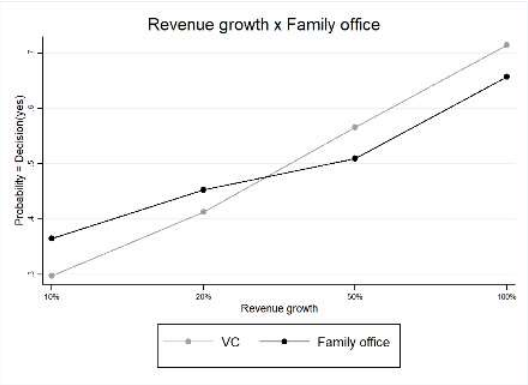
Fig. 16: Interaction effects – FOs vs. VCFs

Panel (a): Marginal effects

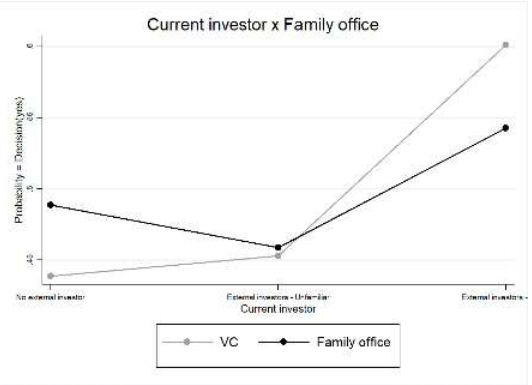
(Profitability x Family office)



(Revenue growth x Family office)

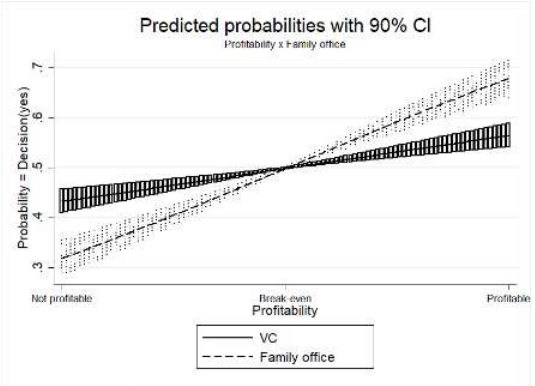


(Current investor x Family office)

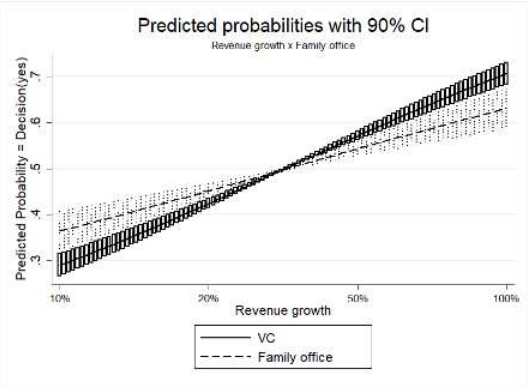


Panel (b): Simulation of predicted probabilities [a]

(Profitability x Family office)



(Revenue growth x Family office)



(Current investor x Family office)

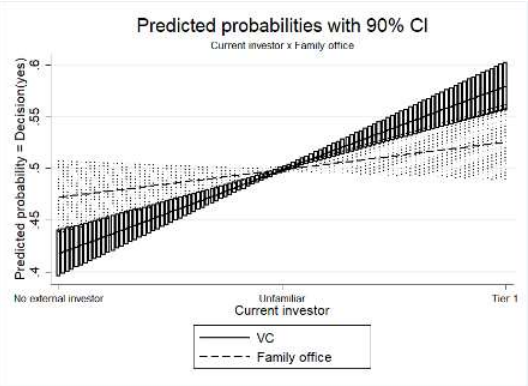
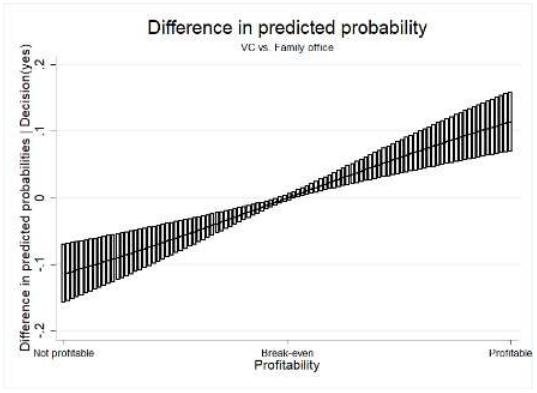


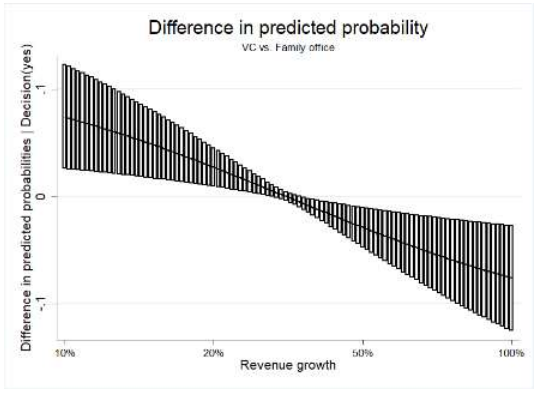
Figure continues on next page

Panel (c): Simulation of differences in predicted probabilities [a]

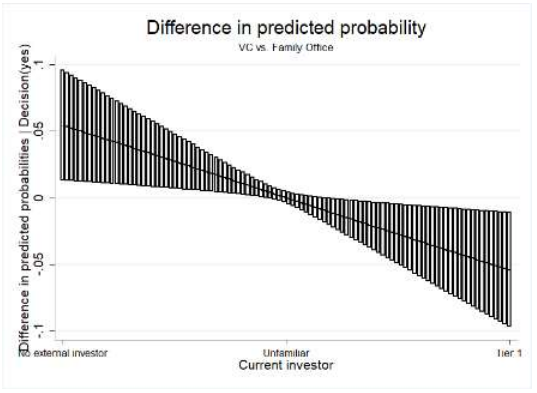
(Profitability x Family office)



(Revenue growth x Family office)



(Current investor x Family office)



Note: [a] Predicated probabilities and difference in predicted probabilities are based on 500,000 random draws using the simulation based approach by Zelner (2009). The difference in predicted probability represent the difference between VCs and family offices. The confidence intervals are calculated using King et al's (2000) simulation-based approach.

Table 46 gives initial support for hypothesis *H1*. The interaction terms for *profitability x family office* indicates statistical significance and indicates that being a FO is associated with higher weighting to break-even (significant at 5% level) or profitable (significant at 0.1% level) ventures relative to unprofitable ventures compared to VCs. FOs seem to strongly attribute more importance to profitable or even break-even entrepreneurial ventures, compared to VCFs. These provisional results are supported by the estimations in Figure 16. The difference in the predicted probabilities between VCFs and FOs shows a positive slope, with the confidence intervals not overlapping zero indicating a statistically significant effect (panel c). This provides evidence that FOs attribute higher weighting to profitability than VCFs within their decision-making.

I find support for *H2*. The interaction term in Table 46 *revenue growth x family office* indicates significant negative effects for very high revenue growth (50% or 100% revenue growth). Especially for 100% revenue growth, FOs attribute a lower importance to this level than VCFs do. Again, I investigate this provisional finding by the estimates in Figure 16. As seen there, the difference in predicted probabilities between VCFs and FOs shows a negative slope, with 90% confidence intervals not crossing the zero. Further analysis shows this interaction to be significant on an at least 5% level. This leads to the conclusion that FOs attribute lower importance to high revenue growth than VCFs.

I find no support for *H3a*. Both interactions terms in Table 46 are negative, indicating less importance attributes by FOs on these levels. This is supported looking at Figure 16, as the estimated marginal effects for the level "external investor - unfamiliar" are nearly identical for FOs and VCFs. On the contrary however, I find that FOs seem to put higher importance to no external investor being present than VCFs, as indicated by the higher marginal effect for FOs compared to VCFs in Figure 16. This effect is positive and statistically significant on a 10% level.

Moreover, this study finds support for *H3b*. FOs seem to attribute less importance to reputable external investors compared to VCFs. The effect is negative and significant on a 5% level, as indicated in Figure 16.

To illustrate the magnitude of the difference in the weighting of the decision criteria between FOs and VCFs, marginal effects were computed for a hypothetical venture with the following characteristics, treating all other attributes as balanced: 100% revenue growth, unprofitable and tier 1 investor being present. This resulted in a predicted probability of 61% for FOs to invest and an 83% probability of VCFs to invest.

To underline the robustness of the main results and to explore these results further, I performed a set of robustness checks and further analyses, reported in Table 47.

First, I re-estimated all of Table 46's models with a standard logit model (instead of a multi-level model). To account for the hierarchical nature of the data I use clustered standard errors at the individual level. Models 1 and 2 show that the results do not differ much between both techniques. With specific regard to the hypotheses, the results show a slight decrease in significance but indicate an overall similar direction and magnitude of the effects, underlining the robustness of the main analysis.

Second, I employed two alternative matching algorithms to check the sensitive of the result with regard to the matching algorithm used. While the main analysis (Table 46) employs a 1-to-5 KNN matching with caliper matching, Model 3 of Table 47 shows the results of the main model when instead using a 1-to-1 matching. Model 4 of Table 47 report the results of 1-to-5 KNN matching without caliper matching. All three matching procedures lead to very similar outcomes. The results underline the robustness of the main analysis because no substantial differences emerge across the models.

Third, although the aim is to identify how the decision-making of FOs, as a category of investors, differ from that of VCFs, FOs are not homogenous. The most widely recognized distinction is between single and multi-family offices, depending on whether the FO is held by a single owner family or multiple families (Wessel et al., 2014). Clearly, goal congruence is likely to be higher among shareholders of single family offices. The owning family and money managers are therefore more likely to act according to shared beliefs regarding investment allocation and risk-return profiles. On the other hand, interacting with other families in multi-family offices allows to achieve a higher scale and efficiency. In this case, families to accept some dilution of ownership, with the expectation of improved investment management. To explore potential differences with regard to investment decisions between both types of FOs, I perform a further analysis and split the sample into single- (SFO) and multi-family offices (MFO). Of the 59 FOs included in the sample, 38 are SFOs (988 decisions) while 21 are MFOs (546 decisions). The results reported in Models 5 and 6 of Table 47 show that no major differences exists in contrast to the main analysis. SFOs and MFOs seem to be consistent in their investment decision behavior.

Fourth, I focus on the decision-making of FOs in contrast to VCFs. VCs are a very suitable and meaningful comparison group because of their importance for entrepreneurial finance. However, there are other investor types that might be similarly interesting to compare to FOs and that could be more similar or more different form FOs than VCFs. The sample included other decision makers than FOs and VCFs which were excluded to enable a clearer comparison. These include growth equity funds and buyout funds. I re-estimate the models using different comparison groups, instead of VCFs. Interestingly, the results reported in Models 7 and 8 of Table 47 show that the differences between FOs and growth equity funds are less pronounced than in contrast to VCFs. The differences between FOs and buyout funds are also less pronounced. Hence, FOs seem to share similarities in terms of decision-making to buyout funds.

Tab. 47: Robustness tests – results from Table 46 and Figure 16

Fixed effects (log-odds)	Model 1 (Re-estimation of Model 2 of Table 46 with clustered standard errors)	Model 2 (Re-estimation of Model 4 of Table 46 with clustered standard errors)	Model 3 (Re-estimation Model 4 of Table 46 with 1:1 matching)	Model 4 (Re-estimation model 4 of Table 46 with 1:5 matching without caliper matching)
Attributes referring to hypotheses				
Profitability (H1, ref: not profitable)				
Break even	0.353*** (0.066)	0.374*** (0.106)	0.206 (0.164)	0.374*** (0.106)
Profitable	0.544*** (0.074)	0.513*** (0.119)	0.650*** (0.193)	0.513*** (0.119)
Revenue growth (H2, Ref: 10%)				
20%	0.493*** (0.076)	0.494*** (0.122)	0.779*** (0.175)	0.494*** (0.122)
50%	1.227*** (0.083)	1.121*** (0.134)	1.496*** (0.210)	1.121*** (0.134)
100%	1.855*** (0.093)	1.914*** (0.148)	2.009*** (0.205)	1.914*** (0.148)
Current investor (H3, ref: no external investors)				
Ext. investors - Unfamiliar (H3a)	0.050 (0.068)	0.035 (0.101)	0.146 (0.151)	0.035 (0.101)
Ext. investors - Tier 1 (H3b)	0.592*** (0.077)	0.598*** (0.120)	0.693*** (0.189)	0.598*** (0.120)
Additional attributes as controls				
Management team (ref: no team member)				
Some team members	0.820*** (0.108)	0.828*** (0.108)	0.796*** (0.176)	0.828*** (0.108)
All team members	1.220*** (0.079)	1.274*** (0.135)	1.420*** (0.210)	1.274*** (0.135)
Business model (ref: low cost)				
Innovation-centered	0.724*** (0.081)	0.777*** (0.128)	0.873*** (0.188)	0.777*** (0.128)
Lock-in	0.691*** (0.078)	0.727*** (0.116)	0.717*** (0.160)	0.727*** (0.116)
Complementary	0.299*** (0.081)	0.258* (0.126)	0.354† (0.181)	0.258* (0.126)
Value-added (ref: low)				
Medium	0.932*** (0.071)	0.995*** (0.109)	0.990*** (0.164)	0.995*** (0.109)
High	1.552*** (0.087)	1.566*** (0.148)	1.594*** (0.209)	1.566*** (0.148)
International scalability (ref: difficult)				
Moderate	0.630*** (0.072)	0.788*** (0.113)	0.796*** (0.197)	0.788*** (0.113)
Easy	1.067*** (0.075)	1.185*** (0.116)	1.221*** (0.185)	1.185*** (0.116)
Interactions[a]				
Profitability: Break-even × Family office	0.485** (0.184)	0.464* (0.202)	0.632** (0.237)	0.464* (0.202)
Profitability: Profitable × Family office	0.894*** (0.202)	0.925*** (0.223)	0.788** (0.270)	0.925*** (0.223)
Revenue growth: 20% × Family office	-0.129 (0.193)	-0.129 (0.215)	-0.414† (0.249)	-0.129 (0.215)
Revenue growth: 50% × Family office	-0.636* (0.247)	-0.530* (0.267)	-0.905** (0.313)	-0.530* (0.267)
Revenue growth: 100% × Family office	-0.652** (0.230)	-0.711** (0.258)	-0.806** (0.294)	-0.711** (0.258)
Current investor: Ext. inv. - Unfamiliar × FO	-0.170 (0.175)	-0.155 (0.190)	-0.266 (0.221)	-0.155 (0.190)
Current investor: Ext. inv. - Tier 1 × FO	-0.374* (0.190)	-0.381† (0.211)	-0.475† (0.257)	-0.381† (0.211)
N (decisions)	10,114	4,966	3,068	5,018
N (individuals)	389	191	118	193

Robustness tests (continued).

Fixed effects (log-odds)	Model 5 (Re-estimation of Model 4 of Table 46 including only SFOs)	Model 6 (Re-estimation of Model 4 of Table 46 including only MFOs)	Model 7 (Re-estimation of Model 4 of Table 46 including growth-equity funds instead VCFs)	Model 8 (Re-estimation of Model 4 of Table 46 including buyouts funds instead VCFs)
Attributes referring to hypotheses				
Profitability (H1, ref: not profitable)				
Break even	0.374*** (0.106)	0.374*** (0.106)	0.727*** (0.098)	1.130*** (0.171)
Profitable	0.513*** (0.119)	0.513*** (0.119)	1.195*** (0.122)	2.010*** (0.193)
Revenue growth (H2, Ref: 10%)				
20%	0.494*** (0.122)	0.493*** (0.122)	0.639*** (0.098)	0.494** (0.164)
50%	1.121*** (0.134)	1.121*** (0.134)	1.295*** (0.107)	0.757*** (0.177)
100%	1.914*** (0.148)	1.914*** (0.148)	1.591*** (0.117)	1.174*** (0.190)
Current investor (H3, ref: no external investors)				
Ext. investors - Unfamiliar (H3a)	0.0354 (0.101)	0.0354 (0.101)	0.142 (0.095)	-0.0666 (0.141)
Ext. investors - Tier 1 (H3b)	0.598*** (0.120)	0.598*** (0.120)	0.277* (0.108)	-0.0190 (0.155)
Additional attributes as controls				
Management team (ref: no team member)				
Some team members	0.828*** (0.108)	0.828*** (0.108)		
All team members	1.274*** (0.135)	1.274*** (0.135)	0.919*** (0.100)	0.893*** (0.149)
Business model (ref: low cost)			1.361*** (0.114)	0.790*** (0.193)
Innovation-centered	0.777*** (0.128)	0.777*** (0.128)		
Lock-in	0.727*** (0.116)	0.727*** (0.116)	0.246* (0.109)	-0.0604 (0.172)
Complementary	0.258* (0.126)	0.258* (0.126)	0.455*** (0.117)	0.501** (0.177)
Value-added (ref: low)			0.207† (0.107)	0.102 (0.154)
Medium	0.995*** (0.109)	0.995*** (0.109)		
High	1.566*** (0.148)	1.566*** (0.148)	0.720*** (0.093)	1.079*** (0.180)
International scalability (ref: difficult)			1.249*** (0.102)	1.489*** (0.179)
Moderate	0.788*** (0.113)	0.788*** (0.113)		
Easy	1.185*** (0.116)	1.185*** (0.116)	0.603*** (0.089)	0.761*** (0.164)
Interactions[a]			0.889*** (0.098)	1.116*** (0.181)
Profitability: Break-even × Family office	0.437† (0.246)	0.570† (0.309)		
Profitability: Profitable × Family office	0.774** (0.263)	1.196*** (0.342)		
Revenue growth: 20% × Family office	-0.083 (0.240)	-0.242 (0.372)	0.111 (0.198)	-0.292 (0.243)
Revenue growth: 50% × Family office	-0.579† (0.307)	-0.573† (0.304)	0.243 (0.224)	-0.572* (0.270)
Revenue growth: 100% × Family office	-0.705* (0.326)	-0.675† (0.346)		
Current investor: Ext. inv. - Unfamiliar × FO	-0.120 (0.213)	-0.226 (0.346)	-0.275 (0.203)	-0.130 (0.242)
Current investor: Ext. inv. - Tier 1 × FO	-0.273 (0.240)	-0.508 (0.360)	-0.704** (0.255)	-0.166 (0.291)
N (decisions)	4,472	4,030	6,448	3,432
N (individuals)	172 (38 SFOs)	155 (21 MFOs)	248	132

This part of the dissertation investigates differences in the decision-making of FOs and VCFs using experimental conjoint data from section 4. It finds that FOs attribute a higher importance to profitability and lower importance to high revenue growth and other reputable current external investors than VCFs in their decision-making when assessing entrepreneurial ventures. I argue this to be a reason due to different goals and structures between FOs and VCFs. Specifically, I find that FOs (in contrast to VCFs) put a significantly higher emphasis on the venture's current profitability, which I attribute to FOs' higher conservativeness and aversion, as they risk losing the family wealth and jeopardize the financial and social wellbeing of future family generations. In contrast, the results suggest that FOs attribute a lower importance to high levels of revenue growth than VCFs. While VCFs are known for their preference for high-growth ventures, FOs are often not as resourceful and as experienced in investing in entrepreneurial ventures and refrain from investing in these potentially more demanding ventures. Finally, FOs more reluctant to co-invest with reputable investors. While FOs and VCFs have a general preference to co-invest with reputable investors, this preference is significantly less pronounced for family offices. This could be because the costs associated with co-investing are higher for FOs in the presence of a reputable investor as the FO will have a weaker negotiation position.

In addition to contributing to the scientific discourse in multiple ways, this section of the study has practical implications. The results provide insights for entrepreneurial ventures seeking equity financing, as they show which characteristics are more important to FOs which are an important provider of entrepreneurial finance to later-stage ventures. FOs differ from VCFs in their decisions and are a distinct investor type. As such, the results of this study can help increase funding chances for entrepreneurial ventures that do not have a high risk/high return profile attractive for VCFs, but instead are growing slower, but with higher profitability. These firms should approach FOs when seeking entrepreneurial finance.

The section of the study suggests multiple avenues for future research. First and foremost, the results indicate that a further investigation of FOs as providers of entrepreneurial finance is warranted, as they represent a class of investors that is different from VCFs. Similar to research on VCFs, future research could thus explore the effect of FOs on portfolio companies, for example in terms of performance or value added. Also, future research might look at the exit strategies of FOs that might differ from those of other providers of entrepreneurial finance. Second, this study focusses on investments in later-stage ventures. It would be equally interesting to investigate FOs' decision-making when investing into early-stage ventures. For

example, FOs might be particularly reluctant to invest in those venture because they entail a higher investment risk. Third, future studies might find it interesting to examine how the differences within the group of FOs influence their investment behavior. While I explore the differences between SFOs and MFOs, individual decision-maker characteristics that have been explored in VC research, such as education and experience, might shape FOs' decision-making in important ways. Relatedly, it is important to understand how the financial and nonfinancial goals of the business families behind the FO shape the decision-making and investment patterns of FOs.

5.5.2 CVC

Another important class of investors are CVCs. CVCs, in contrast to VCFs or growth equity funds, are investors that are incorporated using a corporate structure, often by large multinational companies. Market data from KPMG from 2017 indicate that CVCs participated in approximately 17% of all VC deals globally (KPMG, 2017), thereby showing the importance of CVCs for entrepreneurial ventures.[49] Entrepreneurial ventures have historically relied mainly on independent VCFs, but a growing number of companies are contracting with CVCs (Dushnitsky, 2006; Katila et al., 2008). Well-known entrepreneurial ventures that have received capital from CVCs include: Genentech (several million USD from WR Grace; acquired by Roche AG for 47bn USD in 2009), Dropbox (several million USD from Salesforce Ventures in 2014—the CVC of Salesforce; current market capitalization of approx. 12bn USD—exit via IPO), and Jawbone (several million USD by Deutsche Telekom Capital Partners—the CVC of Deutsche Telekom; already raised approx. 900 million USD by 2018). The relevance of CVCs for providing financing to entrepreneurial ventures makes such institutions an important research object. Prominent CVCs include Intel Capital, Google Venture, Salesforce Ventures, Deutsche Telekom Capital Partners, and TimeWarner Investments.

Even more interestingly, CVCs have different governance structures, goals, value-added services, and incentive systems compared to independent VCFs or other independent equity investors, thus providing an interesting testing ground for various research questions (Gompers & Lerner, 2000; Dushnitsky & Shaver, 2009). CVCs are often structured as subsidiaries of their corporate mothers (Gompers & Lerner, 2000). Table 48 summarizes key differences and similarities between CVCs and independent VCs and elaborates on these differences further.

First, both CVCs and independent VCs follow financial interests when making investments (Dushnitsky & Shaver, 2009). However, a key difference lies in the fact that CVCs also have other goals. CVCs, relative to independent VCs, also pursue the strategic goals of their mother company, such as getting access to novel technologies or sourcing innovation (Ernst et al., 2005; Dushnitsky & Lenox, 2006).

[49] From 2010 to 2017, the average participation rate relative to all global VC deals is approximately 12% (KPMG, 2017).

Tab. 48: Differences between CVCs and independent VCs

Characteristics	**CVC**	**Independent VCs**[50]
Objectives		
Financial gain (*Dushnitsky & Shaver, 2009)*	Yes	Yes
Access to technology and innovation *(Ernst et al., 2005; Wadhwa & Kotha, 2006; Benson & Ziedonis, 2009; Dushnitsky & Shaver, 2009)*	Yes	No
Value-added services provided to companies		
Services for portfolio companies *(Block & MacMillan, 1993; Dushnitsky , 2006; Dushnitsky & Shaver, 2009)*	Yes	Yes
Advanced / unique resources *(Acs et al., 1997; Dushnitsky & Shaver, 2009)*	Yes	No
Incentives and governance structure		
Incentive of management via carried interest *(Gompers & Lerner, 2000; Dushnitsky, 2004; Dushnitsky & Shaver, 2009)*	No	Yes
Captive investor base *(Gompers & Lerner, 2000; Dushnitsky & Shaver, 2009)*	Yes	No

Source: Own illustration based on Dushnitsky & Shaver, 2009

A second difference is related to the services and resources both types of investors can provide to portfolio companies. Both types of investors can provide value-added services that are common in the industry, such as providing strategic advice or recruitment support to portfolio companies (Brander et al., 2002; Baum & Silverman, 2004). However, the special nature of CVCs as subsidiaries of large enterprises can provide portfolio companies with additional value-added services that are not provided by independent VCs. An investment in an entrepreneurial venture by a CVC can provide the venture with resources of the mother entity, such as access to laboratories, distribution channels, production facilities, technology, or clients (Alter & Buchsbaum, 2000; Dushnitsky & Shaver, 2009; Park & Steensma, 2012). Also, the mother

[50] This includes VCFs, growth equity funds and buyout funds.

entity of the CVC might have access to deeper market knowledge and be able to conduct additional research for the portfolio company (Dushnitsky & Shaver, 2009).

Third, the governance and incentive structures of CVCs and independent VCs differ, as CVCs often do not possess the same types of incentive systems as independent VCs or growth equity funds (Dushnitsky, 2004). Generally, CVCs do not have performance-based rewards like independent VCs (e.g., through carried interest) or agreed financial returns to their investors (Gompers & Lerner, 2000). Last, CVCs are structured as a subsidiary of their corporate mother, therefore they are not structured as a limited partnership with a fixed lifetime.

There have been several studies of CVCs, ranging from descriptive articles on their characteristics (Siegel et al., 1988) to the effect of CVCs on their portfolio companies' innovation behaviors and performance (Dushnitsky & Lenox, 2006; Weber & Weber, 2007; Park & Steensma, 2012; Chemmanur et al., 2014) relative to independent investors. Other studies have examined the effects of CVCs on their mother company, particularly as a source of external innovation (Dushnitsky & Lenox, 2005; Ernst et al., 2005). Due to their unique structure, Gompers and Lerner (2000) argue:

> *"Thus, the contrast between corporate and independent venture funds provides a natural test case for examining the effect of organizational structure on investment performance."*
>
> *[Gompers & Lerner (2000)]*

However, research into the decision behavior of CVCs is largely missing, as the majority of the research has focused on independent VCs (see section 2.2). However, there are multiple reasons why the decision making of CVCs might differ compared to other investors, as their characteristics might influence their decision making. The following section elaborates on why different decision behaviors might exist.

5.5.2.1 Theory and hypotheses

Relying on the conceptual model from section 2.1.2, CVCs, like independent equity investors, form principal-agent relationships with their capital providers. For a CVC, the capital provider is the corporate mother, while in case of an independent VC, the limited partners are the capital providers (e.g., pension funds, high net worth individuals, or other institutional investors). This framework might help explain and describe the decision behaviors of CVCs relative to other investors when evaluating later-stage ventures.

One of the first key differences between CVCs and independent VCs lies in their goals. Prior research shows that while CVCs pursue financial goals, they are primarily established to gain access to innovation and novel technology (Dushnitsky & Lenox, 2005). The mother company of a CVC, which is often a multi-national corporation, needs to make use of different innovation strategies to remain competitive and profitable, therefore reducing the risk of going out of business. However, there are many means with which to acquire external knowledge and technology to achieve this goal, ranging from internal innovation sources (e.g., internal R&D or intrapreneurship initiatives) or external innovation sources (e.g., M&A, university research, alliances, open-innovation, or CVC activity). Research has shown that relying solely on internal innovation sources might not be sufficient, due to the organizational limits of the mother company, as innovation requires the combination and integration of unrelated knowledge. Furthermore, empirical research shows that incumbents are systematically less effective than others in exploiting major innovation (Henderson, 1993). To overcome these barriers, large firms can rely on external innovation; one means of this is through investments in entrepreneurial firms, as these firms can be valuable sources of innovation (Kortum & Lerner, 2000; Zingales, 2000). One way of accessing these entrepreneurial firms is through equity investments via CVC investments. Through this type of equity investment, a CVC, and therefore its mother company, obtains direct access to the innovation and technology of entrepreneurial firms. Moreover, a CVC can further shape the initial innovation and make a later decision to buy the entire entrepreneurial venture. This way, large firm can also prevent the access of competitors to the innovation of the entrepreneurial venture. Moreover, due to their advanced technology and product knowledge, CVCs have a better view of other products in the market.

In contrast to this, independent VCs follow only financial goals (Gompers & Lerner, 2000; Dushnitsky & Shaver, 2009). Capital providers (here: limited partners) of independent VCs therefore establish contractual incentive systems (e.g., hurdle rates, carried interest, or management fees) to incentivize management to achieve high financial returns for the risky

asset class of entrepreneurial ventures (Gompers & Lerner, 2000). Independent VCs do not use the actual underlying products or service of the portfolio company for their own means. Therefore, independent VCs do not rely on the innovation potential of the products or services of its portfolio companies. It can be anticipated that this difference will have an effect on individual decision making. Therefore, this study hypothesizes that due to their strategic goals, CVCs will place particular importance on products and service characteristics relative to other characteristics. When later-stage ventures develop a product or service that provides high value-added in the form of significant improvements for its customers compared to the status quo, it can be interpreted as a form of external product or service innovation. Hence, I hypothesize:

> ***Hypothesis H4:*** *In their screening, CVCs attribute greater importance to product value-added than do independent VCs.*

Preventing other competitors from obtaining access to knowledge is a strategy for remaining competitive; with exclusive access to novel technology, one firm can exclude others (Dushnitsky & Shaver, 2009). Next to access to novel products or technology, novel ways of doing business can be a source of innovation—more specifically business model innovation (Trimi & Berbegal-Mirabent, 2012; Spieth et al., 2014). Research argues that entrepreneurial firms are able to create radical innovation by reconfiguring business activities in a novel way, thereby disrupting incumbent firms, which have difficulties in this regard (Freeman & Engel, 2007). Therefore, a new business model can be a source of innovation for large enterprises that try to incorporate such business models into existing structures (Zott et al., 2011). Scholars have shown that large firms have little ability to innovate their own business model (Chesbrough, 2010), so accessing entrepreneurial firms might be a means of overcoming this innovation barrier for corporations. In comparison, independent VCs do not make use of novel business models by themselves, as they have a financial objective and not an innovation objective. They evaluate a business model for the financial impact it can have on their investment, whereas CVCs also evaluate the business model for their corporate strategy. Taken together, I argue that this has an effect on the decision making of CVCs relative to other investors. Hence, I hypothesize:

> ***Hypothesis H5a:*** *CVCs place greater importance on business model attributes than do independent VCs in their screening.*

Moreover, the type of business model might have an effect on decision making. As innovation-centered business models are characterized by innovations in the form of new technology, products, or services to consumers (e.g., new software technology or new materials), this addresses strategic goals of CVCs. From the perspective of the entrepreneurial firm, this might help protect against competition (Block et al., 2015), as new technology might be protected with intellectual property protection mechanisms, such as patents or trademarks. Hence, this might fit with the strategic goal of CVCs to source innovation for the mother company. Such well protected business models might be interesting targets for these large enterprises and their strategies. Based on the above, this study hypothesizes the following:

> ***Hypothesis H5b:*** *CVCs attribute more importance to innovation-centered business models than do independent VCs in their screening.*

In addition to the differences in the objectives of CVCs and other investors, they also have different incentive structures. VCs need to deliver returns to their limited partners over a short period of time (Gompers & Lerner, 2000), which incentivizes them to take on riskier investments, as managers only receive bonus compensation (i.e., carried interest) when the fund manages to return high profits (Dushnitsky, 2004). The short investment horizon of independent VCs indeed exacerbates the short-term vision of fund managers, who are asked by limited partners to provide high returns (Shane, 2012). In contrast to this, CVCs do not possess a structure and incentive system that favors taking high risks. Most of the time, the compensation of investment professionals in CVCs is composed of a base salary and a bonus, which depends on the overall firm performance of the mother company (Dushnitsky, 2004). This incentive mechanism does not reward managers working in CVCs for taking high risk investments, as they would not profit from the upside of such an investment. In addition, high growth potentially incurs uncertainty, as it exposes entrepreneurial ventures to additional risk (e.g., additional managerial risk due to additional staff management) (Fombrun and Wally, 1989). Risk aversion linked through the incentive system, combined with the strategic goal set of CVCs, might not favor high-growth firms in their decision making. Therefore, I hypothesize the following:

> ***Hypothesis H6:*** *CVCs attribute lower importance to revenue growth than do independent VCs in their screening.*

5.5.2.2 Descriptive analysis

To get a first impression of the decision preferences between CVCs and other investors, a descriptive data analysis was performed. Here, CVCs were compared to three different independent equity investors (VCFs, growth equity funds, and buyout funds). Growth equity funds are equity funds that focus only on later-stage companies and therefore do not pursue early-stage opportunities like VCFs. The terms "growth equity fund" and "buyout fund" come from terminology used in the private equity industry, and are often used to indicate that the two investor types focus on later-stage companies for which financial data is available (Gompers et al., 2016a). Buyout funds compared to growth equity funds or VCFs often use part of the investment to buy out existing shareholders, whereas the other two often acquire new shares. The governance structures, goals, and incentive mechanisms are similar across these three investor types (Gompers et al., 2016a).

All four types of investors invest in later-stage ventures. The largest group of investors is VCFs, followed by growth equity funds and then buyout funds. To descriptively compare their decision-making behavior, this study compares the individual zero-centered utility estimates from a hierarchical Bayes regression across the different investor types (see section 5.3 for details about hierarchical Bayes regressions). These utilities are compared across the different investor types using a t-test of equality of means, as shown in Table 49.

Tab. 49: Utility differences (CVC vs. independent investors)

Attribute	Level	CVC *N=66*	VCF *N=330*	GE fund *N=189*	Buyout fund *N=73*
Current revenue growth	10% p.a.	-0.660	-0.791 [a]	-0.781 [a]	-0.660
	20% p.a.	-0.265	-0.322 [a]	-0.274	-0.184 [a]
	50% p.a.	0.228	0.291 [a]	0.299 [a]	0.259
	100% p.a.	0.719	0.827 [a]	0.754	0.596 [a]
Current profitability	Not profitable	-0.327	-0.323	-0.509 [a]	-0.687 [a]
	Break-even	0.040	0.051	0.072	0.092
	Profitable	0.277	0.257	0.443 [a]	0.583 [a]
Value added for customers	Low	-0.742	-0.718	-0.650 [a]	-0.719
	Medium	0.121	0.092	0.095	0.123
	High	0.633	0.614	0.549 [a]	0.583
Business model	Lock-in	0.178	0.198	0.180	0.246 [a]
	Innovation-centered	0.264	0.244	0.157 [a]	0.054 [a]
	Low cost	-0.316	-0.313	-0.247 [a]	-0.244 [a]
	Complementary offering	-0.153	-0.142	-0.091 [a]	-0.040 [a]

Note: a = indicated a statistically significant on an at least 10% level on the difference in the mean between CVCs and the respective group

Table 49 shows that VCFs and CVCs seem to share similar distributions of the estimated utilities, indicating no significant difference in their weighting of the different attribute levels except in terms of current revenue growth; VCFs seem to demonstrate a greater appetite for high growth firms. More differences are identified between CVCs and growth equity funds and buyout funds. In both cases, CVCs seem to put higher importance on innovation-centered business models than either growth equity or buyout funds, therefore supporting the argument used for H5b. In addition, growth equity funds (utility average: 0.549) seem to give lesser importance to high-value added products or services than CVCs (utility average: 0.633), indicating initial support for H4. Growth equity funds and buyout funds seem to place more importance on the profitability of a growth venture. However, this analysis is not sufficient to evaluate the stated hypotheses. Multivariate analysis with interaction terms is more appropriate for testing the hypotheses. Before applying multivariate analysis, this study assesses whether significant differences exist between participants in each of the investor groups (CVC, VCF, GE, and buyout funds). Therefore, several t-test comparisons between groups are executed to identify differences that could lead to selection in the subsequent multivariate analysis. However, using the same variables as in section 5.5.1 (Table 44), these tests show no significant differences between CVCs and the groups of VCFs, GEs, and buyout funds. Only one significant difference regarding the work experience of the individuals is identified. However, this is expected, as investors with CVC backgrounds tend to come from the mother organization and therefore often have significant past corporate experience compared to other investors.

5.5.2.3 Results

To test the hypotheses, an approach is used similar to that described in section 5.5.1. A hierarchical logit regression model is used to evaluate the significance and direction of the effects of attribute levels on decision making. Table 50 reports the results of this regression. Similar to section 5.5.1, the estimated coefficients and their reported significance alone are not sufficient to determine if an interaction is significant in a non-linear model (Ai & Norten, 2003).

Therefore, in addition to the reported regression coefficients, Figures 16 and 17 present additional tests to evaluate the significance of the interactions (the same approach as described in section 5.5.1). These results do not strongly support H4. The interactions in Table 50 are not significant, and Figures 16 and 17 support this conclusion. Only when comparing growth equity funds with CVCs do CVCs show significantly higher importance of the value-added of products or services. This finding is only significant at the 10% level.

Tab. 50: Regression model – CVC vs. independent investors

Fixed effects (log-odds)	**Model 1** *(CVC & VCF)*	**Model 2** *(CVC & GE)*	**Model 3** *(CVC & Buyout)*
Attributes referring to hypotheses			
Revenue growth (H2, Ref: 10%)			
20%	0.493*** (0.0762)	0.639*** (0.0988)	0.494** (0.164)
50%	1.227*** (0.0883)	1.295*** (0.107)	0.757*** (0.177)
100%	1.855*** (0.0933)	1.591*** (0.117)	1.174*** (0.190)
Business model (ref: low cost)			
Innovation-centered	0.724*** (0.0816)	0.246* (0.109)	-0.0604 (0.172)
Lock-in	0.691*** (0.0787)	0.455*** (0.117)	0.501** (0.177)
Complementary	0.299*** (0.0810)	0.207† (0.107)	0.102 (0.154)
Value-added (ref: low)			
Medium	0.932*** (0.0715)	0.720*** (0.0938)	1.079*** (0.180)
High	1.552*** (0.0875)	1.249*** (0.102)	1.489*** (0.179)
Interactions			
Revenue growth (H2, Ref: 10%)			
Revenue growth: 20% × CVC	-0.370* (0.169)	-0.516** (0.180)	-0.372† (0.223)
Revenue growth: 50% × CVC	-0.585** (0.180)	-0.653*** (0.190)	-0.115 (0.237)
Revenue growth: 100% × CVC	-0.614** (0.230)	-0.350 (0.241)	0.0664 (0.284)
Value-added (ref: low)			
Medium × CVC	-0.00791 (0.190)	0.204 (0.200)	-0.156 (0.252)
High × CVC	0.0226 (0.210)	0.326† (0.211)	0.0861 (0.262)
Business model (ref: low cost)			
Innovation-centered × CVC	0.0425 (0.234)	0.521* (0.245)	0.827** (0.279)
Lock-in × CVC	-0.0901 (0.200)	0.146 (0.218)	0.1000 (0.255)
Complementary × CVC	0.00995 (0.182)	0.102 (0.195)	0.207 (0.225)
N (decisions)	10,296	6,630	3,614
N (individuals)	396	255	139
pseudo R^2	0.188	0.173	0.186

Notes: Robust standard errors in parentheses; † < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001; Model is calculated using random intercepts and random slopes.

This study finds support for H5b, as both growth equity funds and buyout funds attribute less importance to innovation-centered business models than CVCs. The results are significant at least at the 5% level as seen in Table 50, and figures 16 and 17 support these findings through the higher marginal effects and non-zero-overlapping curve in Figure 17. Figure 16 particularly highlights that higher marginal effects for innovation-centered business models can be found for CVCs compared to their counterparts. However, the results for VCFs are not statistically significant.

Tab. 51: Utility differences t-test (CVC vs. other investors) – Business model

Level	CVC ***N=66***	VCF ***N=330***	GE fund ***N=189***	Buyout fund ***N=73***
Business Model	11.375	10.621	9.663 [a]	9.783 [a]

Note: a = indicated a statistically significant on an at least 10% level on the difference in the mean between CVCs and the respective group

A separate analysis was carried out to test hypothesis H5a, as attribute importance is estimated differently than levels-based utilities. Based on the hierarchical Bayes regression individual utility estimates, zero-centered attribute utilities are also estimated (see section 5.3 for a further explanation of this). These estimates are then compared across the different investor types using a t-test of means comparison. The results of this analysis are shown in Table 51, which shows support for H5a. Growth equity and buyout funds seem to place significantly lower importance on the design of the business model compared to CVCs.[51]

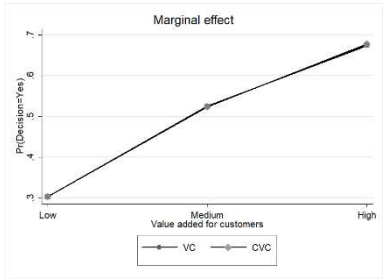
This study also finds support for H6, as seen in Figures 16 and 17. In Figure 17, the slope is negative and does not overlap zero for VCFs and growth equity funds, indicating that CVCs attribute lesser importance to this attribute level. The results are significant at least at the 5% level. Table 50 also reports negative coefficients that are statistically significant at least at the 5% level.

[51] Additional analysis reveals that growth equity and buyout funds instead put particular focus on profitability and revenue growth, both financial characteristics, compared to CVCs.

Fig. 17: Marginal effects – CVCs vs. independent investors

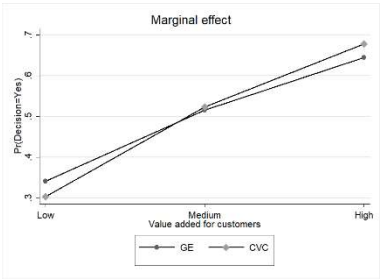
CVC vs. VCF

(Value added x CVC)



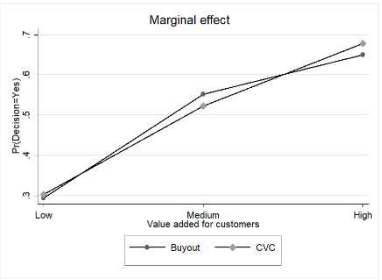
CVC vs. GE

(Value added x CVC)



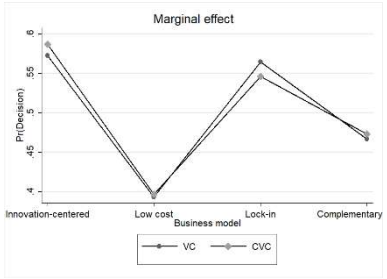
CVC vs. Buyout

(Value added x CVC)



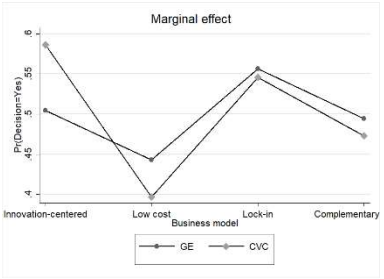
CVC vs. VCF

(Business model x CVC)



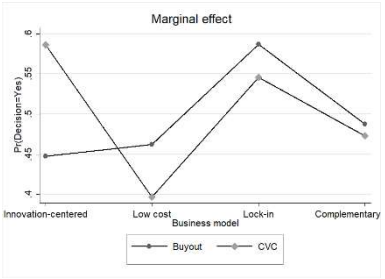
CVC vs. GE

(Business model x CVC)



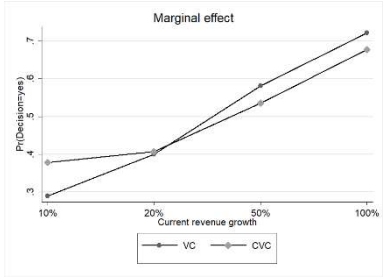
CVC vs. Buyout

(Business model x CVC)



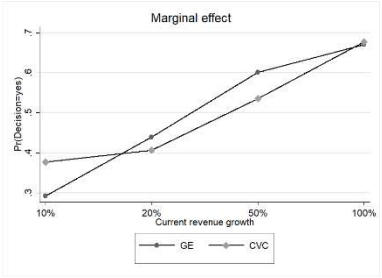
CVC vs. VCF

(Revenue growth x CVC)



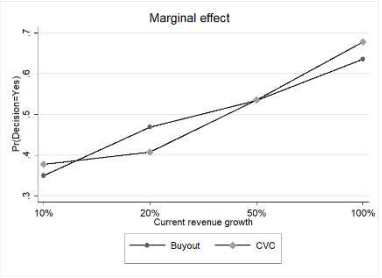
CVC vs. GE

(Revenue growth x CVC)



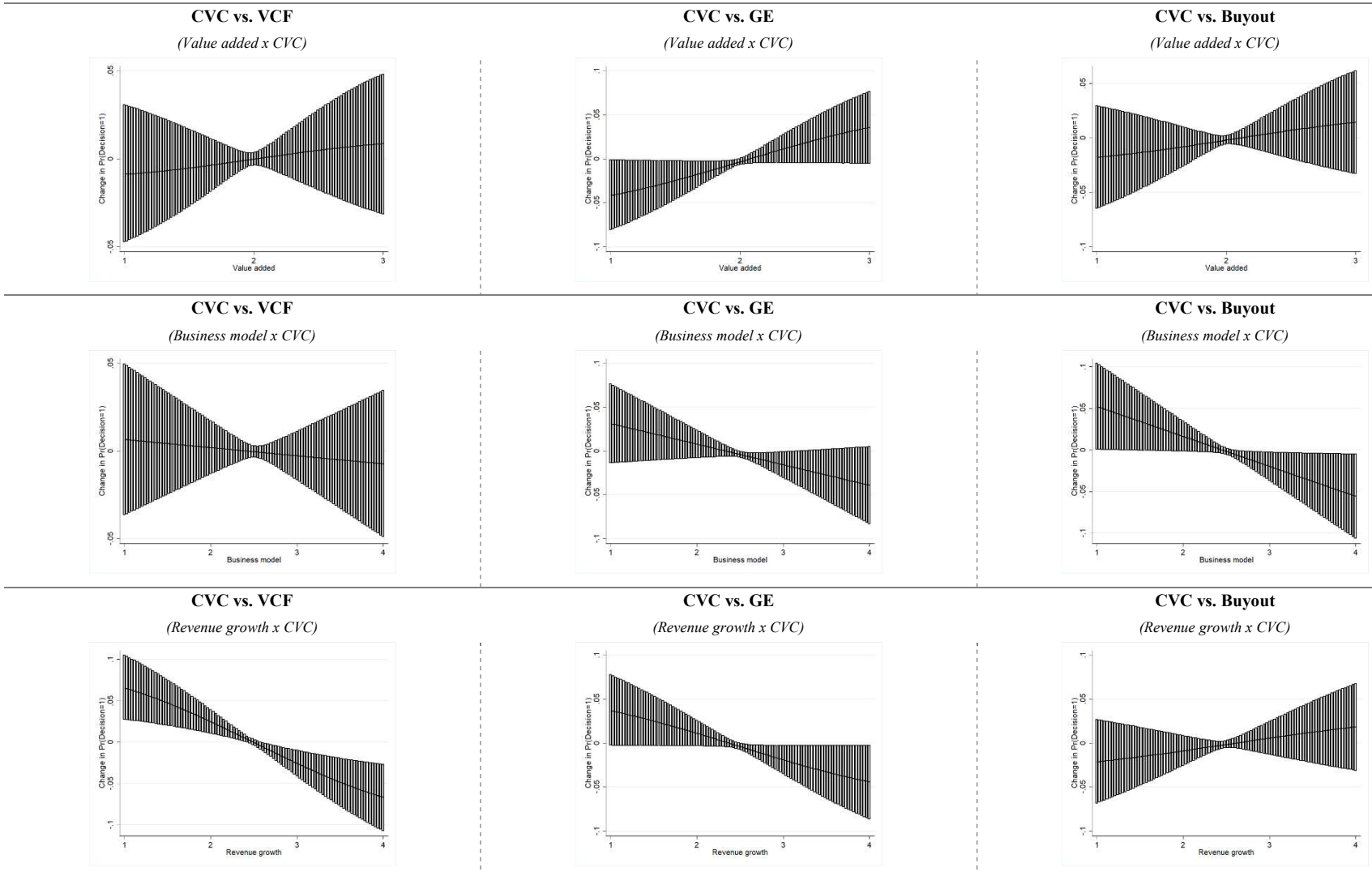
CVC vs. Buyout

(Revenue growth x CVC)



Note: Graph displays marginal effects calculated from Table 50. Same interpretation can be used as described in Figure 16.

Fig. 18: Zelner (2009) – CVCs vs. independent investors



Note: Difference in predicted probabilities are based on 500,000 random draws using the simulation based approach by Zelner (2009). The confidence intervals are calculated using King et al´s (2000) simulation-based approach.

This part of the dissertation investigates differences in the decision making of CVCs and independent VCs using experimental conjoint data from section 4. The results show that CVCs place more importance on the business model design of a later-stage venture than other investors. Particularly, innovation-centered business models that are centered around a novel technology are preferred by CVCs relative to other investors. I argue this to be the case because of the different goals of CVCs compared to other investors: CVCs source and invest in new technology with the objective of innovating for the mother company (Ernst et al., 2005; Wadhwa & Kotha, 2006; Benson & Ziedonis, 2009; Dushnitsky & Shaver, 2009). The results underline this argument.

Surprisingly, the results do not reveal a statistically significant difference in the weighting of products/services value added for customers between CVCs and other investors, even though past research suggests this difference should exist due to the strategic goals of a CVC (Dushnitsky & Shaver, 2009). Even though the results indicate this attribute is significantly relevant for CVCs and other investors, the weighting does not differ across CVCs and other investors. The only minor significant effect is identified in the comparison of growth equity funds with CVCs. A potential reason for this result might be that rather than evaluating the value of an "isolated" product or service, CVCs look for a strategic fit between the venture´s business model design and the strategy of the mother company. Also, the value added for customers of the products/services might be equally important for independent VCs and CVCs, as it might have a direct effect on the company's financial performance, hence fitting the goal set of independent VCs. However, these results also need to be considered with caution, as the data collected does not provide a proxy for the fit between the strategy of the CVC's corporate mother and the business model of the entrepreneurial venture.

By drawing on the different incentive structures of CVCs and independent VCs, this dissertation has shown that CVCs attribute less importance to later-stage ventures with high revenue growth. I argue this to be the case as CVCs often do not have a reward system like that of independent VCs and are therefore not incentivized to make high-risk investments in rapidly growing companies (Dushnitsky, 2004). In contrast to this, independent VCs are incentivized to make high-risk investments, as they disproportionally profit from the return on such investments through carried interest (Gompers & Lerner, 2000).

In addition to contributing to the scientific discourse in multiple ways, this section of the study has practical implications. The results provide insights for entrepreneurial ventures seeking equity financing, as they show which characteristics are more important to CVCs, an

important provider of entrepreneurial finance for later-stage ventures. Here, the findings suggest that entrepreneurial ventures that seek access to corporate financing via CVCs might need to consider the fit of their business model with the CVC and its mother company. As such, the results of this section can help increase funding chances for entrepreneurial ventures that do not have the high-risk/high-return profile that attracts independent VCs, but instead are growing more slowly and have a better fit with the innovation strategy of the CVCs' mother company. These firms should approach CVCs when seeking entrepreneurial finance.

As the previous section argues that CVCs mainly pursue strategic goals when investing and that VCs, growth equity funds, and buyout funds only pursue financial goals, one can argue that this will have an impact on financial performance. To offer an initial insight into this relationship, Table 52 provides the correlations between the different investor types and IRR, as well as individual performance (see Table 34 for an explanation of these variables). As this table shows, the performance measures are negatively correlated with CVCs. VCs, which to some degree demonstrate similar decision behaviors, also show a negative correlation. In contrast to this, growth equity investors and buyout funds are significantly positively correlated with both IRR and the individual performance index. This is, however, just an initial analysis of the link between investors and their performance. A more detailed analysis of the link between decision making and financial performance is presented in chapter 6 of this dissertation.

Tab. 52: Correlation – Performance and different investors types

Level	CVC	VCF	GE fund	Buyout fund	IRR	Performance index
CVC						
VC	-0.2759*					
GE fund	-0.1806*	-0.5156*				
Buyout fund	-0.1022*	-0.2916*	-0.1909*			
IRR	-0.0400	0.0292	0.0243	0.0243		
Performance index	-0.0498	-0.1408*	0.1479*	0.0771*	0.3662*	

Note: Displayed are correlation coefficients. Star indicates a significance on an at least 5% level. N= 658.

6 Decision-making and financial performance

Despite the importance of decision making within the "venture capital cycle," it is also important to view decision making in the context of the financial performance of a VC. Investing in highly successful ventures is critical for the survival and continuation of a VC. For VCs, not meeting financial expectations can threaten further fundraising from capital providers and therefore threaten the existence of the VC. In addition to expectations of financial performance, VCs are confronted with the fact that the majority of their investments result in a negative return or total loss of the investment.[52] VCs often refer to the "80/20 rule" (Top Tier Capital Partners, 2017), a rule of thumb that 80% of the fund's return is generated by 20% of the portfolio companies. This is in the same vein as other studies indicating that >60% of all venture capital investments fail (McDermott, 2012; Blodget, 2013; Wagner, 2013; Gompers et al., 2016a). This puts further pressure on VCs to identify high performing ventures and develop them to a stage where they can return a significant profit via a trade-sale or IPO. This means that VCs must be particularly good at selecting the right ventures ("selection effect") and supporting these ventures until the exit-stage ("treatment effect") (Amit et al., 1998; Bertoni et al., 2011).

Therefore, it is important for scholars and practitioners to understand the association between VCs' decision making and their performance. Due to the skewed distribution of the returns of VCs, such as VCFs, it is particularly relevant to investigate VCs that have been able to achieve returns >10x the initial costs of the investment and to identify association with this performance. Gompers et al. (2016a) showed in a large scale survey on VCs that only 9% of all VCs are able to return >10x the initial cost of the investment. A well-known example of a VC that has been able to frequently achieve such returns is the US-based venture capital firm Sequoia Capital. For example, Sequoia Capital generated a return of approximately 42,000% on the initial investment in WhatsApp when it sold its shares to Facebook (t3n, 2014). Other prominent ventures that returned >10x to their VC backers include Facebook, Twitter, and LinkedIn.

There have been many studies that have evaluated financial performance and its determinants for private equity investors. These studies focus on the relationship between investor networks and financial performance (Hochberg et al., 2007), the association between investor experience and financial performance (Gompers et al., 2006; Sørensen, 2007), the degree of

[52] A study by Sahlman (1990) shows that 64.5% of venture capital investments end up in a loss, partial loss, or maximum 1.9-fold return on initial costs, compared to only 6.8% of investments that end up in 10x or higher return on initial costs of the investment. This is similar to studies from Murray (1999), Mason and Harrison (2002), and Gompers et al. (2016a).

specialization and its relationship to a successful exit (Gompers et al., 2009), and the reputation of investors and its relationship to performance (Nahata, 2008; Krishnan et al., 2011). Moreover, several studies take a closer look at "treatment effects" through the active involvement of investors in their portfolio companies, often referred to as value-added services or "smart money" (MacMillan et al., 1989; Sapienza, 1992; Ehrlich et al., 1994; Sapienza et al., 1996). However, within decision-making research (see section 2.2.2.), studies that attempt to evaluate the potential association of decision making and financial performance are largely absent. As a result, very limited knowledge is available about the association between decision making and the financial performance of VCs in conjunction with other characteristics of VCs, such as experience, entrepreneurial background, specialization, or value-added services. Therefore, the final section of this dissertation is an effort to fill this research gap by assessing the relationship using an exploratory approach and answering the following research question (RQ5): *What is the association between decision-making behavior and the financial performance of VCs that invest in later-stage ventures?*

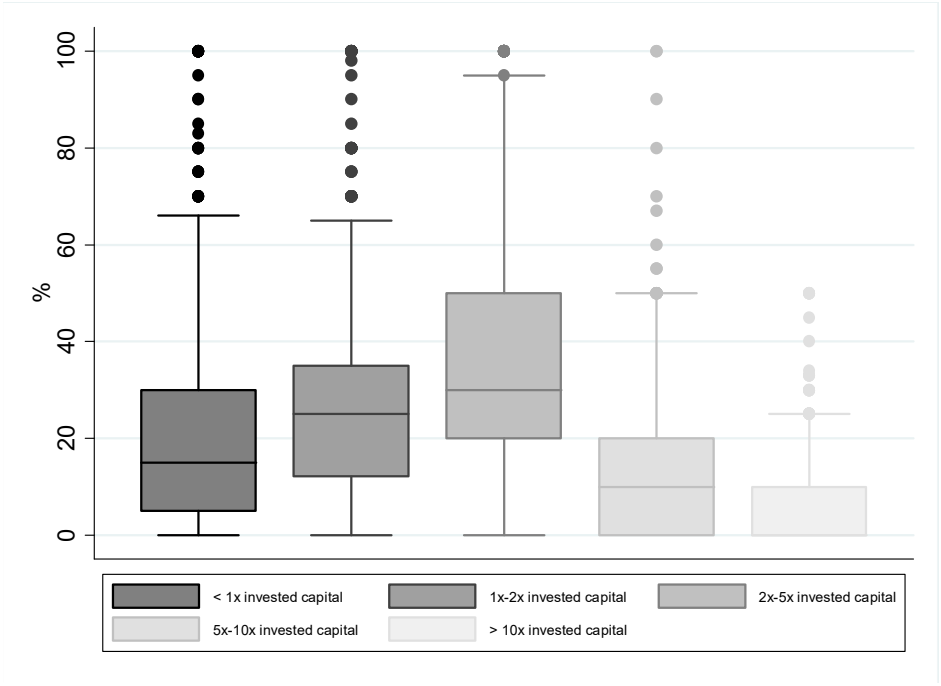
6.1 Measuring financial performance

In past studies, IPOs are often used to measure the financial success of private equity investors as an institution. Often this is done via a binary split of portfolio ventures that reached an IPO (successful companies) and ones that did not (unsuccessful companies) (e.g., Bengtsson & Hsu, 2010; Cumming & MacIntosh, 2003; Gompers et al., 2016a; Gompers et al., 2016b). Nevertheless, this approach to measuring financial performance has a drawback, as the majority of VC exits happen via trade-sales and not IPOs, therefore the approach neglects an important part of VCs' portfolios. However, in more recent studies, cash-on-cash multiples or internal rate of return (IRR) are the performance measures most frequently used by market participants (Gompers et al., 2016a).[53] These measures offer a more complete picture of the financial performance of an investor at the firm and individual levels, as they provide a pure financial measure of the success of an investment and can be compared across various exit types (e.g., trade-sale, liquidation, or IPO).

[53] A cash-on-cash multiple is the measure of $\frac{Absolut\ return\ of\ investment}{Initial\ investment}$ and is often expressed in a multiples formant, such as 5x, indicating that the investment returned five times the initial investment. The internal rate of return (IRR) is the interest rate / discount rate (r) at which the net present value (NPV) of an investment stream is zero. The NPV is the discounted value of all cash-inflows C_t minus the initial investment: C_0: $NPV = \sum_{t=1}^{T} \frac{C_t}{(1+r)^t} - C_0$. The IRR is the respective value of r, when $0 = \sum_{t=1}^{T} \frac{C_t}{(1+r)^t} - C_0$.

Within the conjoint study of this dissertation, participants were asked to report these two financial performance indicators. First, participants were asked to provide information on their personal performance via cash-on-cash multiples achieved in the past. Here participants were asked to answer the following question: Please fill in the approximate percentage (%) of deals you participated in that returned A) <1x invested capital, B) 1x-2x invested capital, C) 2x-5x invested capital, D) 5x-10x invested capital and E) >10x invested capital.[54] This question collected important information on the personal performance of a decision maker within a private equity investor. Figure 19 presents the answers of the 749 participants in a box-plot.

Fig. 19: Box-plot of cash-on-cash multiples



Source: Own illustration based on data from 749 participants

Across the data from 749 participants in the study, Figure 18 shows that the median of investments returning <1x of the invested capital is 15%, with an arithmetic mean of 20% and standard deviation of 20.9, indicating that around 1/5 of all investments from the participants resulted in a total or partial loss of the investment. This is in line with results from Gompers et al. (2016a) of 24%. Moreover, the majority of returns in the study are <5x of the invested capital. Aggregating the data from investments that returned A) <1x invested capital, B) 1x-2x invested capital, and C) 2x-5x invested capital, the data shows that, on average, 83% of all deals

[54] This categorization of cash-on-cash multiples is similar to those used in Gompers et al. (2016).

are in this range of cash-on-cash multiples. Interestingly, only a small fraction of investors had participated in deals that returned >10x the invested capital. Of all participants in the study, 60% had never participated in a deal that returned a >10x cash-on-cash multiple. On average across all deals, only 4.6% resulted in such cash-on-cash multiples. This result is slightly lower than the proportion reported by Gompers et al. (2016a) of 9%. This is a first important insight for market participants and policy makers, as it shows that on average, only one investment out of 25 will be able to return >10x the invested capital. In addition to the cash-on-cash multiple, participants were also questioned about the gross IRR of their investment firm. Table 53 shows the distribution of average gross IRRs across the sample.

Tab. 53: Gross IRRs of investors in the sample

IRR	N	%
<0%	3	0.47%
1-10%	41	6.48%
11-20%	240	37.91%
21-30%	228	36.02%
31-40%	83	13.11%
>40%	38	6.00%
Total	**633**	**100%**

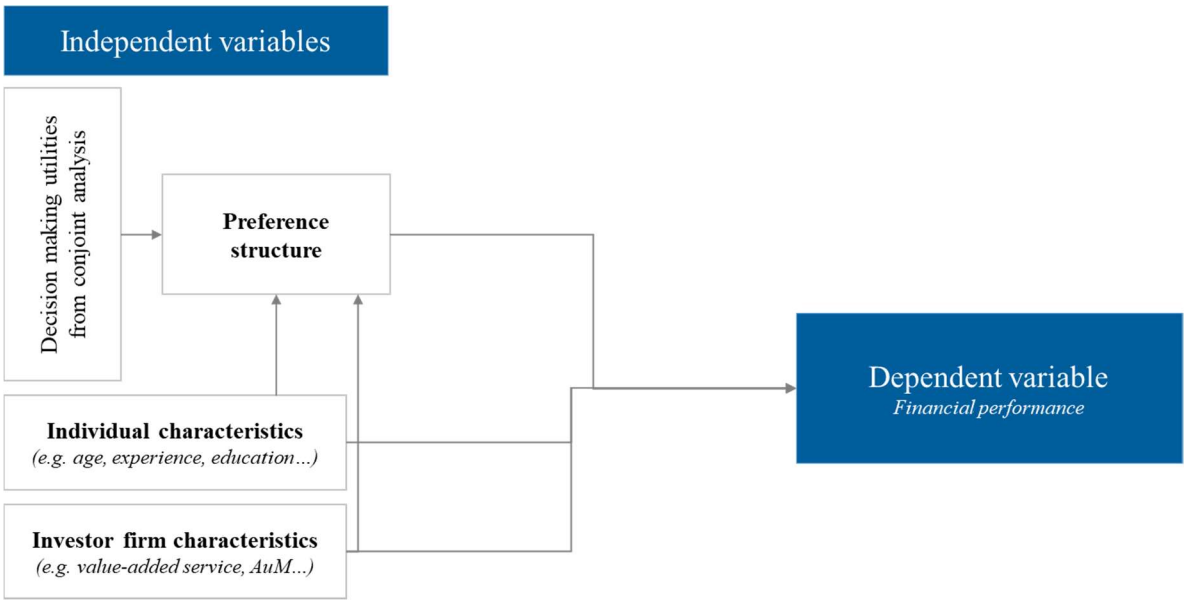
Source: Own illustration.

As seen in Table 53, and similar to the data of cash-on-cash multiples, only a small percentage of investors is able to achieve very high returns (Gompers et al., 2016a; Gompers et al., 2016b). Here, only 6% of all participants reported having an IRR >40%. As this chapter's research question considers the relationship between decision making and financial performance, and decision making was measured at the individual level, it is more appropriate to use the recorded measure of cash-on-cash multiples rather than IRR to answer the research question. This allows us to answer questions such as whether an investor that particularly focuses on the team is achieving greater average returns.

6.2 Exploratory quantitative analysis

To explore the potential association between decision making ("selection effect") and influential characteristics of the investor ("treatment effect") and the individual decision maker's financial performance, the following exploratory conceptual model is used. Figure 20 illustrates this model.

Fig. 20: Conceptual model – decision behavior and financial performance



Source: Own illustration.

The "selection effect" is assumed to be linked to the preference structure captured via the conjoint experiment. Different preference structures might lead to different investor financial performance. As seen in sections 5.4 and 5.5, these preference structures are influenced by individual and firm-specific characteristics. However, despite having an effect on the preference structures of individuals, these individual and firm-specific characteristics might also have a direct effect on the performance of each portfolio company, not just a direct effect on decision making. Experienced investors might have acquired specific knowledge about the challenges and needs of later-stage ventures and be able to more effectively support them than novice investors. A similar argument might be made based on different resource pools, as in section 5.5.2 for CVCs. Therefore, the direct effects of these characteristics on financial performance are also assessed. This is, of course, not without limitations, and the results need to be treated with caution as outlined later in this section.

This thesis uses three distinctive characteristics and assesses their influence on the financial performance of a VC. The dependent variable in this case is the reported cash-on-cash multiple of investors. A binary variable is created, taking one if the investor had at least 1 deal that returned >10x the invested capital and zero otherwise. Factors that may influence the probability of this important measure are assessed through this. The three distinctive characteristics that are examined in relation to this financial performance measure are 1) the attribute utilities

taken from the conjoint experiment on all seven attributes[55], 2) individual characteristics of the decision maker (e.g., age, experience, or entrepreneurial experience), and 3) characteristics of the investment firm (e.g., industry focus, value-added services, or AuM). The following logit model is used to investigate the relationship between these three characteristics and financial performance:

$$g(p_{High\ return}) = \log\left(\frac{p_{High\ return}}{1 - p_{High\ return}}\right) = \beta_0 + \beta_k x_k$$

Here $p_{High\ return}$ is the probability that an individual made at least one deal that returned >10x the invested capital. β_0 is the intercept of the logit model and β_k are the k coefficients to be estimated based on the variables x_k. The first seven independent variables $x_1, x_2 \ldots x_7$ represent the utility estimated for current revenue growth, current profitability, management team (track record), value added for customers, current investors, international scalability, and business model from the conjoint experiment with the help of a hierarchical Bayes model to estimate the relative importance of each attribute (Lenk et al., 1996).[56] The results from a hierarchical Bayes model were normalized (zero-centered) to simplify the comparison of results such that the sum of all importance values equals 100%. The second set of independent variables include characteristics of the individual decision maker, such as experience as an investor, age, gender, tenure, and entrepreneurial experience. Past research has shown that human capital in the form of experience is positively associated with firm performance, therefore addressing an important variable (Crook et al., 2011). Additional control variables include field of education, position in firm, number of board seats, and syndication preferences. As well as providing capital, VCs also provide additional benefits to their portfolio companies (Brander et al., 2002; Baum & Silverman, 2004). Interestingly, VCs spend approximately 60% of their time supporting their portfolio companies. They provide portfolio companies with support in hiring new board members or introducing them to potential clients via the investors' network (Gompers et al., 2016a; Gompers et al., 2016b). This was the motivation for recording several measures during the conjoint study, asking participants what type of value-added services they provide to portfolio companies. Additional control variables included on this level are region, number of cross-border deals, number of staff, investor type, and industry focus. No additional variables are included to measure the effects of individual and firm-specific characteristics on preference

[55] As CBCs allow for individual utility estimation via hierarchical Bayes regression, these estimates are used in this analysis. See section 5.3 for further details.

[56] See section 5.3 for further details.

structures, as this is to some degree already taken care by the hierarchical Bayes approach (Lenk et al., 1996; Orme, 2000).

The described logit model is calculated stepwise by first including only 1) the attribute utilities taken from the conjoint experiment on all seven attributes via hierarchical Bayes modeling, then adding 2) individual characteristics of the decision maker (e.g., age, experience, or entrepreneurial experience), with the last model adding 3) characteristics of the investment firm (e.g. industry, value-added services, or region). However, the described approach is not without limitations. As the study measures decision making and financial performance separately and on an aggregate level, conclusions drawn from the results need to be interpreted cautiously. Moreover, as the average length of a venture capital cycle from initial investment to final exit is between five and ten years, a cross-sectional dataset like the one used in this dissertation might not be fully appropriate for addressing the research question.

6.3 Results

The results of a multivariable logit regression can be found in Table 54. As seen in this table, investors that have higher estimated importance of revenue growth (relative to the estimated importance attributed to internal scalability) have a statistically significant higher chance of participating in a >10x deal. This result is statistically significant at the 5% level. In terms of magnitude, the odds of participating in a >10x deal are increased by 1.329 ($e^{0.285} = 1.329$) times for investors that have higher estimated importance values for the attribute of revenue growth compared to others. This might be linked to the type of investments VCFs often make, which can be characterized as high risk investments (Ueda, 2004). Many of their investments fail, and only a few are able to provide large returns. This requires that at least some ventures in the investment portfolio promise high growth (Davila et al., 2003). Moreover, investors that place higher importance in their decision making on the business model of later-stage ventures seem to have significantly higher chances of participating in a >10x deal. However, this effect is only significant at the 10% level. Different decision behaviors seem not to have strong explanatory power for high performing investors, indicating small "selection effects." In addition, the pseudo R^2 is relatively low for the first model (Model 1), indicating the small predictive power of decision behavior for the likelihood of a 10x deal.

Models two and three provide additional insights into the association between individual and investment firm characteristics and financial performance. Interestingly, having former entrepreneurial experience as an investor is associated with statistically significantly higher

chances of having participated in a >10x deal. The odds of having participated in a >10x deal are increased by 1.719 ($e^{0.542} = 1.719$) times for former entrepreneurs relative to investors not having had entrepreneurial experience. The results are significant in models two and three at the 1% and 5% levels, respectively. An argument related to the analysis done in section 5.4 can be used here. Studies show that entrepreneurial experience can affect individual behavior and knowledge through the learning achieved during the time spent as an entrepreneur (e.g., Ucbasaran et al., 2003a; Ucbasaran et al., 2003b; Franke et al., 2008; Ucbasaran et al., 2010; Farmer et al., 2011; Shepherd et al., 2015). Therefore, investors that were formerly entrepreneurs might be able to more adequately support entrepreneurs than those who were not, thereby increasing the company's chances of success. In addition, the length of experience as an investor is associated with a higher likelihood of having participated in a >10x deal. The results are significant in models two and three at the 5% and 1% levels, respectively. These results provide the first evidence of strong "treatment effects" on financial performance. Being an investor for a long period of time allows one to see many investment opportunities and follow many entrepreneurial ventures along the way. Nevertheless, experienced investors might possess more complete and domain-specific schemata to help companies along the way.

On the investment firm level, the value-added services provided by investors are only associated with individual financial performance to a limited extent. None of the independent variables in this category show signs of statistically significant influence on the dependent variable, except PR or marketing support provided by the investors. The model shows a significantly positive influence of this value-added service at the 5% level. However, most investors provide this value-added service to their portfolio companies, leaving little room for variation in the independent variables (e.g., 92% of all investors provide strategic advice to their portfolio companies).

Tab. 54: Logit regression – Decision-making & financial performance

Variables (log-odds)	**Model 1**	**Model 2**	**Model 3**
Decision-making characteristics			
Attribute importance: Management team	0.0133	0.0205	0.0202
	(0.0145)	(0.0161)	(0.0176)
Attribute importance: Profitability	-0.0147	0.00539	0.0212
	(0.0151)	(0.0170)	(0.0190)
Attribute importance: Revenue growth	0.0285*	0.0384*	0.0263
	(0.0137)	(0.0153)	(0.0170)
Attribute importance: Current investors	0.00169	0.0140	0.00713
	(0.0232)	(0.0264)	(0.0286)
Attribute importance: Business model	0.0190	0.0488*	0.0469†
	(0.0204)	(0.0228)	(0.0249)
Attribute importance: Value-added for customers	0.0100	0.0209	0.0220
(reference: attribute importance: international scalability)	(0.0155)	(0.0171)	(0.0188)
Individual characteristics			
Gender		0.114	0.154
		(0.268)	(0.287)
Age		-0.0479	-0.0259
		(0.115)	(0.127)
Experience as investor		0.0285†	0.0551**
		(0.0158)	(0.0181)
Tenure		0.00631	0.0145
		(0.0174)	(0.0199)
Entrepreneurial experience		0.542**	0.422*
		(0.192)	(0.209)
Further individual characteristic controls		*Field of education* *Position in firm* *Number of board seats* *Syndication preferences*	
Investment firm characteristics			
Value-added: Coaching / mentoring			0.213
			(0.236)
Value-added: Strategic coaching / consulting			-0.119
			(0.354)
Value-added: Recruitment support			-0.225
			(0.212)
Value-added: Marketing support			0.532*
			(0.214)
Value-added: Business development support			0.120
			(0.253)
Value-added: Support next fundraising			-0.294
			(0.238)
Further investment firm characteristic controls			*Region* *Cross-border deals* *Staff* *Investor type* *Industry*
Summary statistics			
N	749	749	749
Correctly classified	57.68%	68.89%	73.44%
pseudo R^2	0.015	0.138	0.220
Chi-square test	15.26***	141.0***	224.3***

*Standard errors in parentheses; † p < 0.10, * p < 0.05, ** p < 0.010, *** p < 0.001; dependent variable: 1=participated in deal >10x cash-on-cash multiple, 0=not participated in deal >10x cash-on-cash multiple.*

In addition, a robustness analysis is carried out on Model 3 in Table 54. The robustness analysis is displayed in Table 55.

Tab. 55: Additional robustness analysis – Decision-making & financial performance

Variables (log-odds)	Model 3 (Table 54)	Model 4 (dependent variable: individual performance index; method: linear regression)	Model 5 (dependent variable: >10x CoC Multiple raw measure; method: Poisson regression)
Decision-making characteristics			
Attribute importance: Management team	0.0202	0.257	0.00870*
	(0.0176)	(0.373)	(0.00341)
Attribute importance: Profitability	0.0212	0.00665	0.00849*
	(0.0190)	(0.401)	(0.00379)
Attribute importance: Revenue growth	0.0263	-0.144	0.00659*
	(0.0170)	(0.362)	(0.00332)
Attribute importance: Current investors	0.00713	-0.957	-0.00738
	(0.0286)	(0.610)	(0.00557)
Attribute importance: Business model	0.0469†	0.502	0.0110*
	(0.0249)	(0.537)	(0.00506)
Attribute importance: Value-added for customers	0.0220	0.181	0.00656†
(reference: attribute importance: international scalability)	(0.0188)	(0.404)	(0.00373)
Individual characteristics			
Gender	0.154	6.415	-0.0702
	(0.287)	(6.131)	(0.0575)
Age	-0.0259	-3.072	0.0544*
	(0.127)	(2.810)	(0.0249)
Experience as investor	0.0551**	-0.160	0.0156***
	(0.0181)	(0.386)	(0.00328)
Tenure	0.0145	-0.188	0.00310
	(0.0199)	(0.415)	(0.00346)
Entrepreneurial experience	0.422*	9.842*	0.340***
	(0.209)	(4.602)	(0.0425)
Further individual characteristic controls		*Field of education* *Position in firm* *Number of board seats* *Syndication preferences*	
Investment firm characteristics			
Value-added: Coaching / mentoring	0.213	7.218	-0.0905†
	(0.236)	(5.018)	(0.0470)
Value-added: Strategic coaching / consulting	-0.119	8.974	-0.234***
	(0.354)	(7.377)	(0.0624)
Value-added: Recruitment support	-0.225	-5.088	0.0184
	(0.212)	(4.528)	(0.0423)
Value-added: Marketing support	0.532*	10.56*	0.265***
	(0.214)	(4.607)	(0.0417)
Value-added: Business development support	0.120	-3.217	-0.168***
	(0.253)	(5.363)	(0.0486)
Value-added: Support next fundraising	-0.294	-7.813	-0.0885†
	(0.238)	(5.107)	(0.0486)
Further investment firm characteristic controls		*Region* *Cross-border deals Staff* *Investor type* *Industry*	

*Standard errors in parentheses; † p < 0.10, * p < 0.05, ** p < 0.010, *** p < 0.001; dependent variable: 1=participated in deal >10x cash-on-cash multiple, 0=not participated in deal >10x cash-on-cash multiple.*

Model 4 in Table 55 replicates Model 3 from Table 54 and just uses a different operationalization of the dependent variable. Here the overall individual performance index is used (see section 5.2) in a linear regression model. Model 5 in Table 55 uses the raw measure of the *>10x CoC Multiple* variable instead of a binary encoding. As seen in Table 55, a certain level of variation in significance can be identified. However, for the effect of the entrepreneurial experience and experience as investors, further support is identified.

Additionally, the models from Table 54 re recalculated using an IRR measure as the dependent variable and an ordered logit model. This resulted in slightly different result, as many variables are not anymore statistically significant in the model. However, this might be the case due to measurement of the financial performance metrics on the investment firm level. As the IRR on the firm level is an aggregated measure across many partners in the firm, it incorporates high performing and low performing individuals, making it difficult to link it with decision-making behavior of individual decision makers. The IRR is also time dependent, making it difficult for participants to remember or even calculate the appropriate figure.

A further analysis was carried out, in order to further evaluate the results from Table 54. As the analysis from Table 54 was done with individual attribute utilities based on the hierarchal Bayes regression, the question arises weather also individuals sharing approximately the same decision behavior have on average a higher chance of a >10x deal participation. Therefore the results from Table 54 were recalculated using the clusters identified from section 5.3. The results are similar to the ones in Table 54.

The analysis above tries to bring explorative insights into the link between decision-making and financial performance of VCs. By combining measures for decision-making ("selection effect" and portfolio-support ("treatment effect"), this analysis has provided initial hints on this relationship. Result show that prior entrepreneurial experience as well as the investment experience seem to help explaining differences in individual financial performance. This is relevant for both market participants as well as academics. For investment firms looking to hire new staff for their firm, one might consider individuals with entrepreneurial background or long investment experience over other candidates. Even for the investors of VCs, these insights can be valuable, when they assess proposals of VCs. Moreover, value-added services provided by VCs only provide limited explanation power for the financial performance on the individual level.

Interestingly, no significant association is identified between the decision behavior described via the conjoint experiments and the individual financial performance. However, the above mentioned results need to be treated with caution, as I measure decision-making and financial performance separately and on an aggregate level. Moreover, as the length of a venture capital cycle from initial investment to a final exit is on average between five and ten years, a cross-sectional dataset like the one used in this dissertation might not be fully appropriate for the addressed research question. However, the results might provide initial hints for further research, when investigating determinates of financial performance of VCs.

7 Conclusion, discussion and limitation

7.1 Conclusion and summary

Making decisions is one of the key tasks of VCs when assessing entrepreneurial ventures. These investors often get hundreds of proposals from entrepreneurial firms every year. Within just a few minutes, they need to make a decision whether they want to go further with the opportunity or reject it. This makes investigating decision-making a highly important task for scholars, investment firms, and their investors, because as soon as investments are made, they can be deemed illiquid, and their success is significantly dependent on the management team of the venture. From prior research, it is known that around 0.5–5% of all initial opportunities get funded (Franke et al., 2004; Petty & Gruber, 2011; NVCA, 2014). Not only do these investors need to make a decision when presented with an initial business idea (e.g., in the early-stage), but also when they deal with more mature entrepreneurial ventures ("later-stage ventures"), which have secured initial market success and want to rapidly grow further. Theory and practice suggest that investors investigate each type of venture differently, as they have different goals, risks, and available information. Moreover, past research has mainly focused on decision making for early-stage ventures and neglected the important category of later-stage ventures.

Therefore, this study has investigated the decision-making behavior of VCs in the particular context of later-stage ventures, first by assessing what information investors utilize (see chapter 3) when they make screening decisions in the context of later-stage ventures. Based on qualitative interviews with 19 investment professionals, the first important insight gained is that for different stages of venture development, different decision criteria are applied. Participants attributed this to different risks and goals of ventures at different stages, as well as the different types of information available. Participants mentioned various decision criteria they assess during an initial screening of a later-stage venture, including 1) revenue growth, 2) business model design, 3) profitability, 4) current investors, 5) international scalability of the company, 6) value-added of the products/services, and 7) track record of the management team as the most important criteria they investigate. These decision criteria in the context of later-stage ventures contrast with results from studies that focus on early-stage ventures. Later-stage ventures possess meaningful information on financials (revenue growth and profitability), the established business model, and existing external investors that is not available for early-stage ventures and therefore constitute new decision criteria for this specific context. Moreover, other criteria such

as the management team are evaluated differently compared to early-stage ventures. The differences in the criteria used for later-stage ventures compared to early-stage ventures is one of the key findings of this dissertation.

Following this identification of the most relevant decision criteria for investors in the context of later-stage ventures, a conjoint study with 749 participants was carried out to understand the relative importance of decision criteria. The results showed that investors attribute the highest importance to 1) revenue growth, (2) value-added of products/services for customers, and (3) management team track record, demonstrating differences when compared to decision-making studies in the context of early-stage ventures that indicated the team as the most important criteria (see section 2.2.2). Additional investigation showed that the importance attributed by investors to very high revenue growth can be affected by other attribute levels.

Not only do the characteristics of a venture influence the decision to invest, additional indirect factors, such as individual characteristics or characteristics of the investment firm, can influence individual decisions. Relying on cognitive theory and schemata, this study investigated the influence of various individual characteristics on screening decisions and found that both investment experience and entrepreneurial experience have an influence on individual decision-making behavior. Former entrepreneurs seem to favor different types of business models than non-entrepreneurs, and more experienced investors than novice investors favor the track record of the management team. Serial entrepreneurs put less emphasis on profitability, revenue growth, and value-added of products/services compared to one-time founders.

This study also examined whether goals, incentive structures, resources, and governance of the investment firm influence decision making in the context of later-stage ventures. I therefore particularly investigated two distinct types of investment firms, family offices and corporate venture capital funds, which have unique structures, goals, and incentive systems. Additional quantitative analysis showed that family offices put less focus on high-growth firms and whether reputable investors are present. They tend to focus more on the profitability of a later-stage venture in the initial screening. This dissertation argues that this is the case due to the combination of financial and non-financial goals that family offices pursue and their governance structure, which is unlike that of limited partnership structures in VCFs. In contrast to this, a second analysis was carried out to investigate if decision makers working for corporate venture capital funds also show different decision-making behaviors compared to other VCs, as a result of following strategic goals as well as financial goals and different inventive systems compared to independent VCs. The analysis showed that CVCs place greater importance on

product and business model characteristics than other investors. CVCs also favor later-stage ventures with lower revenue growth rates, indicating a preference for less risky investments.

Decision making is an important part of the venture capital cycle, but there is still a question whether investors are good at selecting the right ventures or the development of ventures. Following the analysis on decision behavior, an additional exploratory analysis was carried out to assess whether decision making or other characteristics influence the financial performance of VCs. Interestingly, the results showed that investors with former entrepreneurial experience are associated with statistically significantly higher chances of having participated in high-return deals. Similar results are found for highly experienced investment professionals. On the level of the investment firm, the value-added services provided by investors are only slightly associated with the financial performance of individuals. Decision-making behavior only accounts for a small part of the variance in financial performance. Table 56 lists the research questions stated in section 1.2 and a summary of the answers derived through the analysis in this dissertation.

Tab. 56: Summary of results for research questions

Research question	Summarized answer
RQ1	• Investors primarily assess 1) revenue growth, 2) business model design, 3) profitability, 4) current investors, 5) international scalability of the company, 6) value-added of the products / services and 7) track record of management team when screening later-stage ventures. • Investors use different screening criteria for later-stage ventures than for early-stage ventures.
RQ2.1	• The top three decision criteria when screening later-stage ventures are 1) revenue growth, (2) value-added of products / services, and (3) management track record. • The signaling effect from Tier 1 investors is significant, but not very strong in terms of magnitude compared to other criteria.
RQ2.2	• The importance of high current revenue growth is influenced by other attribute levels.
RQ3.1	• Experienced investment professionals show slightly different decision-making behavior than novice investors • Investors with longer investment experience tend to put more weight in their decision on the track-record of the team than other investors.
RQ3.2	• Entrepreneurial background can influence individual decision-making behavior, due to level of importance associated with the business model of a later-stage venture.
RQ4.1	• Family offices show different decision-making behavior in their screening than VCFs. • Family offices attribute more importance than VCFs to the profitability of a later-stage venture in their decision and less importance to revenue growth and reputable investors being present.
RQ4.2	• CVCs demonstrate different decision-making behavior than VCFs, growth equity funds, or buyout funds. • CVCs put more importance on innovation-centered business models and the value-added of the products or services than other institutional investors do and less on revenue growth.
RQ5	• Financial performance can be partially explained by decision behavior ("selection effect") and by support provided to portfolio companies ("treatment effect"). Managers with an entrepreneurial background and longer investment experience seem to show higher financial performance than others.

7.2 Implications for theory and practice

Implications for practice

The conclusions drawn from this study provide valuable insights for scholars, policy makers, and market participants, particularly entrepreneurs and risk capital investors. Starting with implications for practice, this study offers important insights for entrepreneurs looking for growth financing. The results show that entrepreneurs need to carefully select the type of investor they want to target and even more carefully select the person in the investment firm they want to target. Based on the results, different types of ventures attract different types of investors. When looking for financing as a later-stage venture, profitable, but not aggressively growing later-stage ventures are more appealing to family offices compared to VCFs, whereas entrepreneurs relying on an innovation-centered business model might have a better chance receiving financing from CVCs. Entrepreneurs with high-risk strategies might find VCFs suitable for securing financing. By making entrepreneurs aware of these tendencies, the results of this study can help increase the funding chances for entrepreneurial ventures. Moreover, as investors can consist of large teams, this study should make entrepreneurs aware that not only should they consider which type of investor to approach, but also which person within the investment firm. Depending on the characteristics of their venture, entrepreneurs might favor approaching investment professionals with former entrepreneurial experience or lengthy investment experience.

Moreover, this study provides insights for the investor community by providing benchmarking data for market participants to compare decision-making behavior and financial performance (Franke et al., 2008). It can also serve as a basis for investors to reflect on their own decision-making behaviors compared to other investors and identify internal deviations from the investment firm's investment policy. Furthermore, investors need to reflect on their team composition, as results indicate that more experienced investors with entrepreneurial backgrounds have a higher likelihood of achieving high financial returns. This might provide guidance for recruitment strategies of investment firms, to focus their recruitment initiatives on people with entrepreneurial or lengthy investment backgrounds. This is also relevant for the limited partners / investors that provide capital to such investment firms. They should carefully select the investment firm and team in which to invest. In the context of this study, limited partners/investors might want to look for team members with entrepreneurial backgrounds or lengthy investment experience to increase their chances of high financial returns. The results provide even

further implications for limited partners/investors, as they can use the results to benchmark the decision-making behavior of funds they have invested in and identify outliers.

In addition, this study offers insights for policy makers that want to close financing gaps for entrepreneurial ventures in their economies, particularly for later-stage ventures. Policy makers should be aware that supporting only one type of investor for providing capital to later-stage ventures might lead to a failure to support the full scope of later-stage ventures, but instead support only a certain fraction that follows the preferences of one type of investor. This can also mean that policy makers should think of spreading financial products to several different types of investors (e.g. VCFs, FOs, CVCs, or other investor types). The results also provide guidance for policy makers when nurturing external investors in an ecosystem, as it provides insights into what characteristics are most valuable to the investor community to stimulate and support the ecosystem. This might mean removing barriers, such as administrative or tax barriers, for later-stage ventures to ensure strong growth and attract risk capital.

Implications for theory

This study also provides insights for theory. First, it provides insights for the entrepreneurial finance literature that focuses on decision making of VCs (Sharma, 2015). Past studies have largely neglected the development stage of a venture when assessing investors' decision making (Shepherd, 1999b). This study shows that this shortcoming is an issue, as results from past studies cannot be extrapolated to ventures in later stages of development. Investors expressed the use of different decision criteria for early-stage ventures than for later-stage ventures. Further studies that investigate decision making of VCs should clearly describe the type of venture that is under investigation and consider the stage of development when assessing decision making. This can help avoid confronting equity investors with ventures that do not fit their investment preferences due to a different stage focus (Mason & Stark, 2004).

Second, contrary to previous studies that focus on early-stage ventures, this study shows that investors do not put the highest importance on the management team in the case of later-stage ventures, but rather on the historical financial growth of the firm and the value-added of the products/services (Silva, 2004; Franke et al., 2008; Nunes et al., 2014). Further studies should therefore be careful when using criteria previously identified for early-stage ventures in studies of later-stage ventures. Results have also shown that interaction effects can exist between attributes; however, scholars should clearly assess the magnitude of such effects. This dissertation indicates these are limited in magnitude.

Third, the results indicate that investment decisions are not influenced only by information signals sent by entrepreneurial ventures. Both institutional characteristics (e.g., governance structures, goals, or resources) and individual characteristics (e.g., investment experience or entrepreneurial background of investment professionals) influence the interpretation of different decision criteria (Shepherd et al., 2003; Franke et al., 2008; Connelly et al., 2011; Hsu et al., 2014). Agency theory is particularly helpful for explaining the effects of these characteristics on decision making, especially different decision patterns (Hsu et al., 2014). Further research in this domain is still needed to understand agency theory in the context of VC decision making. This also applies to decision-making research in early-stage ventures.

Fourth, the study also provides a methodological contribution to the literature on decision-making behavior of equity investors. Past research has primarily relied on self-reported data and only partially investigated decision-making behavior with real-time methods. However, even studies using real-time methods, such as conjoint experiments, have a key limitation as they present investors with hypothetical ventures via a rating scale (e.g., Shepherd, 1999a, Shepherd, 1999b; Franke et al., 2004; Franke et al., 2006, Franke et al., 2008). However, in reality, investors make a discrete yes or no decision rather than a rating decision, calling for more choice-based approaches in future studies.

Fifth, this study provides a conceptual model for investigating decision making in future research initiatives. It shows that future studies need to consider individual characteristics of decision makers in private equity firms when studying decision making. In addition, principal-agent structures and resource endowment should be controlled for in decision-making investigations, as well as cognitive schemata of individual investment professionals.

7.3 Limitations and future research avenues

As in every study, this dissertation is not without limitations, starting with the methodological approach of assessing decision-making behavior of equity investors. This study uses real-time measurement of decision-making behavior to overcome limitations in previous studies that rely on post-hoc analysis (see section 2.2.2) (e.g., Shepherd & Zacharakis, 1999; Elgar et al., 2005; Shachar & Eckstein, 2007). However, the conjoint approach used in this dissertation is not without limitations. Conjoint analysis only allows measurement of decision-making behavior for hypothetical ventures and therefore cannot take into account the entire universe of information signals that are sent an investor (e.g., the color of a business plan or source of the business opportunity). For every additional attribute included in a conjoint study, more decisions per individual are required to allow accurate and efficient estimates (Orme, 2010). However, this often quickly reaches its limits, as participants are unlikely to invest the extra time needed to complete the study or will frequently use simplification strategies. Nevertheless, studies still show the reliability of conjoint studies in predicting decision making in reality and appropriately describing the preference structures of participants (Lohrke et al., 2010). Future research should consider combining various techniques to get a better picture of VCs' decision making.

The main method used to acquire data for this dissertation was a web-based conjoint analysis with an additional survey; this has some limitations. Even though conjoint studies incorporate a real-time exercise, the data is still self-reported. Instead of creating this artificial data collection exercise (e.g., conjoint study, survey…), scholars should investigate other means of answering research questions in this field that can rely on archival data from VCs. Often risk capital investors store information electronically on all the investment opportunities they receive (e.g. pitch-decks of entrepreneurial firms, performance of portfolio companies, or minutes of investment committee meetings). This can be a valuable source for scientific purposes to better understand not only the decision making of VCs, but also the context. Moreover, such archival data can provide scholars with a very valuable foundation for assessing other important questions in this field. Currently, many researchers in this field use aggregated data that is unfortunately missing either the nature of time-series data or underlying details (see overview in Nunes et al., 2014). Archival data can also help demystify risk capital investing and clarify whether risk capital investing is really "more art than science".

An additional point is related to the collected data of family offices and business angels. This dissertation managed to obtain initial data on family offices and business angels, which are rarely available due to the privacy and confidentially of these two types of investors (Wessel et al., 2014; Zellweger & Kammerlander, 2015). More research should be carried out to better understand the dynamics of these investors, as they account for an important part of the investor base for entrepreneurial ventures.

In addition to considering other data sources in future research projects, the methods employed can potentially be further enhanced. Therefore, in terms of quantitative methods, machine-learning approaches (supervised and unsupervised learning) offer an unexplored set of advantages for the entrepreneurial finance literature. The hierarchical Bayes approach used in parts of this study is a first attempt (Lenk et al., 1996; Orme, 2000). These methods can particularly help identify patterns in data, which can lead to additional theory building and identification of new phenomena in VCs' decision making.

Another limitation concerns the focused view of this dissertation on investment decision behavior. Based on previous literature, investment decisions can be characterized as one of the most important tasks of risk capital investors, therefore emphasizing the relevance of this dissertation. However, decision making is only part of an entire venture capital cycle from initial fundraising to exiting portfolio companies (Gompers & Lerner, 2001; Gompers & Lerner, 2004). Therefore, this dissertation cannot fully answer questions such as how decision behavior translates into performance of individual portfolio companies or how decision behavior of individuals might change over time or be adapted based on experience. This limitation is particularly relevant for the last research question (RQ5) of this dissertation. Therefore, the exploratory results on how decision making might influence financial performance need to be treated with caution. Still, these are important questions to be addressed by further research; if relevant data are made available, researchers might be able to provide further insights.

This dissertation has focused on the decision criteria in the initial screening of investments by VCs. However, past research shows this to be a multi-stage process (Tyebjee & Bruno, 1984; Fried & Hisrich, 1994; Boocock & Woods, 1997; Kollmann & Kuckertz, 2010; Petty & Gruber, 2011). Following the initial screening, many other actions and decisions are made by investors before finally coming to a contract. The screening decision is only one part of this lengthy decision process. The other aspects of the decision process were not assessed in this dissertation, as a result of the conjoint methodology and the importance of the screening decision in the overall process (Franke et al., 2004). This is a limitation of this study that mainly

applies to RQ1-RQ4.2 and therefore limits the results to the screening decision, not the overall investment decision. Future research should try to assess the whole process and evaluate if the weighting of criteria changes over time (Kollmann & Kuckertz, 2010).

Even though this research relies on signaling theory, principal agent theory, and cognitive theory to understand decision making, more theory usage and building is needed to understand the decision making of VCs. Past studies have mainly been exploratory and data driven (see overview in section 2.2). Additional research is required to provide more generalizable and theory-based results. Further, it is not clear what theory helps accurately predict decision behavior of VCs; for example, the magnitude of the impact of cognitive schemata on decision making was assessed as rather low.

Moreover, VC plays an important role in financing young entrepreneurial firms and hence supporting innovation; however, from a macroeconomic picture, most of the funds do not come from venture capital institutions. This means it is also important to compare the decision behavior of multiple other investors (e.g., banks, accelerators, or venture debt funds). This might help entrepreneurial firms find more suitable investors for their businesses. This is also a limitation of this dissertation, as it is focused only on equity investors.

Finally, this dissertation has focused primarily on later-stage ventures, as a stage of company development specialized in by risk capital investors. Using the definition in section 2.1, later-stage ventures have been differentiated from early-stage ventures. However, in practice and scientific literature, no clear definitions exist for terms like “seed,” “pre-seed,” “start-up-stage,” “Series A,” “Pre-Series A,” “early-stage,” “expansion-stage,” “A2 stage,” and many others. Scholars should focus on establishing definitions of both the investment and development stages of entrepreneurial firms; this would be beneficial for both academics and practitioners. Moreover, the findings regarding RQ3.1–RQ4.2 (impact of individual characteristics and investment firm characteristics on decision behavior) are limited to later-stage ventures and cannot be generalized to early-stage ventures. Here, further research is needed.

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Appendix

Tab. A1: Data of investors on website

No.	Investor	About us on website*	Source (Website)
1	CapMan's Growth Equity *(FIN)*	CapMan's Growth Equity portfolio consists of exciting **unlisted Nordic growth companies in various fields**. […] The objective of the Growth Equity investment activities is to find **unlisted target companies** with the **potential to grow rapidly**, to make significant **minority investments** in them and, as an active investor, to develop their value so as to achieve returns in excess of the market average. […] We aim to find growth companies that operate in sufficiently large markets and have the opportunity to take advantage of their service and solution innovations both in Finland and internationally. Our investment criteria further include **professional and committed management**, **innovative service/product, proven business plan, growing revenues, significant market potential and unique competitive advantage.**	www.capman.com
2	DN Capital *(UK)*	We are a young dynamic team, passionate about **technology and building great long-term companies**. […] We are a global early and growth stage investor with operations in London, Menlo Park and Berlin, **focusing on market places, e-commerce, software, mobile apps and digital media**. […] We ourselves operate like a start-up, and through our own experiences, global network and sector expertise support entrepreneurs to build and grow their own businesses.	www.dncapital.com
3	Acton Capital *(GER)*	Supporting **fast-growing companies** is our passion. We see ourselves not only as investors, but also as dependable strategic and operational navigators, guiding our portfolio companies as they **head for leadership in national and international markets**. Our drive is centered on developing these companies in partnership with their founders.	www.actoncapital.com
4	HPE Growth Capital *(NED)*	We are a dynamic team of 12 with years of experience in technology investing across Europe and the US. We provide **leading technology companies** with relevant experience and institutional capital to support outstanding **management teams in accelerating growth**.	www.hpegrowthcapital.com
5	CapitalG *(USA)*	At CapitalG, we invest in growth. **We help technology company's scale** with support from Google's vast expertise and resources.	www.capitalg.com
6	IDInvest Partners *(FRA)*	Idinvest Growth Fund II completes Idinvest's range of expertise within Venture investments by investing in high potential businesses that have **already built great products or services and have proven customer adoption**. The companies targeted by Idinvest growth fund have achieved **annual revenues of over €10M+ in a capital efficient manner** whilst **rapidly growing the business typically over 40% per year**. Although our focus is to invest in European companies and teams, we are not limited to Europe and can invest as needed.	www.idinvest.com
7	Nokia Growth Partners *(USA)*	We invest in **growth-stage companies**. It's not about the series you are raising – **whether it's B, C or D – it's all about growth**. We invest in companies with **high growth potential**, companies that **already have a shipping product** and a **business model validated by customers**. NGP is an active investor who can help you grow.	www.nokiagrowthpartners.com
8	Orange Growth Partners *(NED)*	We invest in **high growth companies** primary in EMEA and Asia and prefer to be the **first Institutional Investor** at a time when **there is proof of concept** and **there are some revenues**. Our investments range from EUR 250k to EUR 10 million over the lifetime of the company, which typically represents a **minority stake**. […] We support founders to scale their **companies into successful international leaders** through the experience of our team and our network of Global leading Financial and Technology Institutions and advisors to accelerate the scaling and monetization of the growth.	www.ogc-partners.com
9	H.I.G. Growth Partners *(USA)*	H.I.G. Growth Partners is the dedicated growth capital investment affiliate of H.I.G. Capital, a leading global private equity investment firm with $22 billion of equity capital under management. We seek to make **both majority and minority investments in strong, growth oriented businesses** located throughout North America, South America and Europe. We will invest $5 million to $30	www.higgrowth.com

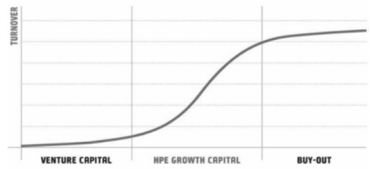
		million in equity in a given company and target investments in **profitable growth oriented businesses with between $10 million and $100 million in revenues**. We consider investments across **all industries**, but focus on certain high-growth sectors where H.I.G. has extensive in-house expertise such as technology, internet and media, healthcare, consumer products and technology-enabled financial and business services.	
10	Highland Europe *(UK)*	Highland Europe was launched in 2012 and closely collaborates with Highland Capital Partners, an independent global venture capital firm with a twenty-seven year investment experience and offices in Boston and Palo Alto. […]The companies we seek to invest in are **addressing large market opportunities in internet, mobile and software**. They will also have **significant scale**, typically over €10 million in **current annualized revenues and growing fast**. Our investments will generally have a European angle but a **Global ambition**. […] Our investments generally range in size from €10M to €30M. Our capital enables management teams to accelerate growth and build a lasting, valuable business.	www.highlandeurope.com
11	Kennet *(UK)*	Kennet invests in European and North American businesses with **real customers and strong revenue growth**. We like businesses that have identified a way to break out of traditional markets. **Our favourite companies are bootstrapped**. They are managed by their founders or by management teams that are significant equity shareholders. Our funding is used to **accelerate expansion**, to fund acquisitions, to bolster the balance sheet, or to cash out existing shareholders. We are patient investors, and in most cases our holding period is between two and five years. **We invest in you and your team**. Our approach is to contribute proactively on your Board of Directors, but not to interfere in the day-to-day running of your business.	www.kennet.com
12	Keensight Capital *(FRA)*	Keensight Capital is an independent European growth private equity firm with more than 15 years of proven investment success in **supporting the management teams of profitable, growing companies**. We provide capital to finance organic growth, enable strategic acquisitions, or help buy out existing shareholders.	www.keensightcapital.com
13	Baird Capital *(USA)*	Baird Capital makes venture capital, growth equity and private equity investments in strategically targeted sectors globally. Since 1989, we've raised and managed more than $3.1 billion and invested in nearly 300 portfolio companies. […] We partner with company management, founders and entrepreneurs with the goal of building **world-class companies across our sectors of focus**: Healthcare, Industrial Solutions, and Technology and Services. […] **We work with our companies to help them grow**. Our team of investment, operating and human capital professionals collaborates closely to provide relationships and operating resources to our portfolio companies. As a global private equity firm with investment and operating professionals located across three continents, we are well-positioned to help lower-middle-market companies succeed in the global marketplace.	www.bairdcapital.com
14	BCV Partners *(USA)*	We started BCV in late 2012 as a **software-focused venture capital firm to address gaps in the growth stage funding market**. Where most growth stage funds saw rounds too small to be interesting, we saw an opportunity to deliver a highly differentiated offering. By being flexible on amount invested, ownership requirement and exit horizon, we enable entrepreneurs and their investors to efficiently raise the "right sized" financing which minimizes dilution and leads to an optimal round. BCV partners with leading VC funds in providing growth capital to their most promising portfolio companies. **As a new investor coming into a round, we are comfortable leading a round or following terms set by insiders**. We have no minimum ownership requirement, are flexible on exit horizon and do not seek board representation. We are thorough, but efficient, in making investment decisions and seamlessly work with management and the lead VC investors in conducting our diligence under the existing timeline. In addition to providing capital and assisting with strategy, recruiting and customer introductions, we bring a unique set of value-adds to our portfolio companies including: A network of 25 active tech entrepreneurs serving on BCV's Executive Advisory Board; buy-side execution capabilities and exit planning leveraging the fund partners' banking experience; assistance with international expansion through active international LPs and operating partners based in Singapore and London; access to institutional and non-institutional funding through contacts with later stage VC and PE firms as well as domestic and international strategic investors and family offices.	www.bluecloudventures.com

15	Norwest's Growth Equity *(USA)*	Norwest's Growth Equity team invests in **profitable, market leading companies that demonstrate exceptional growth potential**. We take a long-term and flexible approach to partnering with founders and executives in both minority and control investments. Our proven and repeatable research process for finding and evaluating investments allows us to uncover value creation opportunities that others might not see. We then work collaboratively with management teams to help companies achieve their full potential. Norwest's platform includes proprietary strategic resources that give our portfolio companies a distinct advantage over the competition. Our returns are driven by growth and fundamental improvements to a company's strategic position.	www.nvp.com
16	General Atlantic *(USA)*	Dedicated to Growth Equity Since 1980. […] Helping **growing businesses rise to new heights is our purpose and our passion**. Drawing from over three decades of experience investing in 250 growth companies, we focus exclusively on partnering with exceptional companies that have **proven business models and strong revenue growth in dynamic industries**. Today we have $20 billion in assets under management, as of June 30, 2016. We know that fast-growing businesses are different. They face a unique set of challenges and opportunities. Many are at an inflection point in their development, looking for a patient and strategic partner to help them transform from an ascending star into an enduring market leader.	www.generalatlantic.com
17	TPG Growth	TPG Growth was founded in 2007 to specialize in growth equity and middle-market buyout opportunities. Taking a long-term and hands-on approach to partnership, we identify unique companies across the U.S., Europe, Africa, and Asia and help them achieve their full potential. **We can assist at all stages of a company's growth, from its inception to its international expansion**, by drawing on our geography-specific experience and expert global operational resources from the TPG platforms. TPG Growth currently manages approximately $8.4 billion in assets across a variety of sectors including media, technology, and industrials.	www.tpg.com
18	China Growth Capital *(CHN)*	In Greater China, we primarily target **minority growth equity investments** in high quality companies that operate in industries that we believe will be the primary drivers of China's economic growth over the next decade. We seek **outstanding management partners** that are in need of both growth capital and constructive equity sponsorship to satisfy a range of balance sheet, governance and strategic needs. The day-to-day operations of Ares Corporate Opportunities Fund Asia, L.P. (2011) are managed by an experienced team of dedicated local professionals headquartered in Shanghai with offices in Chengdu and Hong Kong. The team has demonstrated an ability to (i) generate compelling deal flow from an extensive network of well-established relationships and proprietary intermediary contacts, (ii) win mandates on high value-add rather than high valuation and (iii) execute well-structured transactions after a thorough and systematic due diligence process.	www.aresmgmt.com
19	Stripes Group *(USA)*	Stripes Group is a leading growth equity firm that makes $10-150 million investments in **Internet, Software, Healthcare IT and Branded Consumer Products** businesses. Our approach to investing is founded on five core principles.	www.stripesgroup.com
20	TA Associates *(USA)*	For nearly 50 years, TA has helped hundreds of growing companies in our five target industries reach their full potential. We partner with you to **accelerate growth and create lasting shareholder value**. […] We work collaboratively with **great management teams** to take your business to the next level of profitable growth. Our partnership approach begins with active, strategic involvement at the board level, while helping to scale your company by leveraging our global resources and core competencies.	www.ta.com

Bold text not highlighted in original text

Source: Own illustration.

Fig. A1: Investor positioning focus illustration



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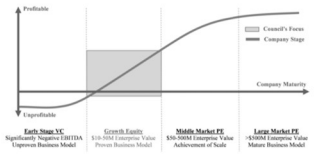

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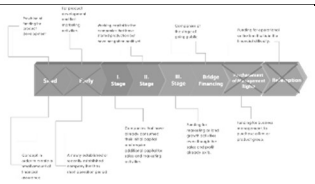

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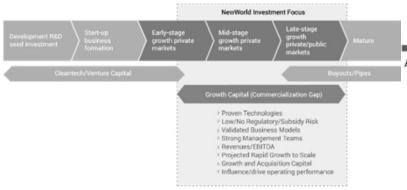
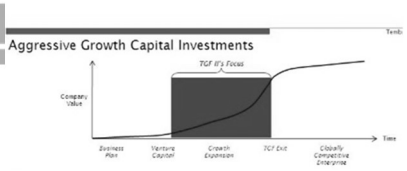
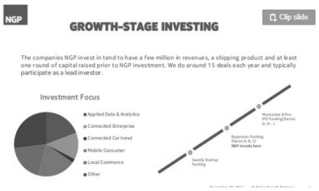


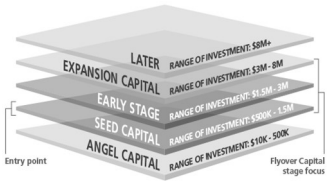
NewWorld Investments



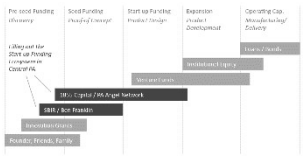
TGF



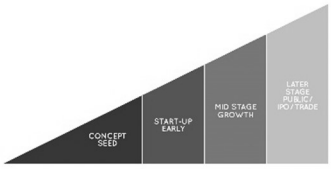
Nokia Growth Partners



Flyover Capital



1855 Capital



Polar Light Capital

Source: Own illustration based on investors website

Tab. A2: Investment criteria on homepage

No	Investor	Investment criteria on homepage	Website
1	BCV Partners	▪ SaaS, enterprise business application software, infrastructure software and open source software ▪ $10.0+ million revenue run-rate; profitable or clear path to profitability; we also consider exceptional earlier stage companies with high growth potential ▪ Invest $3 – $10 million as part of $10+ million growth rounds; opportunistically price & structure round	www.bluecloudventures.com
2	Kayne Anderson Capital	▪ Operate in an attractive industry niche with clear competitive advantages and asset light/capital efficient business models ▪ Technology is being employed to solve large, well-established problems ▪ Growing and recurring revenue of $5 to $50 million ▪ Cash flow positive or break-even, or there is a clear path to becoming profitable ▪ Growing, proven businesses that have experienced management teams who are interested in minority/non-control investments ▪ Initial investment size of $5 to $20 million, with ability to make additional investments	www.kaynecapital.com
3	HPE Growth Capital	▪ Excellent and ambitious management teams ▪ Technology that is scalable and protected in hi-tech, soft-tech and internet-enabled businesses ▪ Western Europe with focus on Germany and the Benelux ▪ Strong track record of growth with a solid customer base ▪ Turnover beyond EUR 10 Million (500.000 MRR) ▪ Healthy business model with profitable margins at scale ▪ A clear path to profitability ▪ Growth investments of EUR 10 to 30 Million ▪ Socially and environmentally responsible	www.hpegrowthcapital.com
4	Catalyst	▪ $10 million – $60 million, larger with co-investment ▪ Typically <$250 million enterprise value ▪ Significant market opportunity ▪ Proven business model and customer demand ▪ Strong franchise or defensible market position	www.catalyst.com
5	Milestone Partners	▪ Revenue: $15–$150 million ▪ EBITDA: $3–$20 million ▪ Transaction size: $15–$150 million ▪ Equity Investment: $5–$40 million ▪ Headquarters in North America (may have significant overseas operations)	www.milestonepartners.com
6	Pamlico Capital	▪ Annual revenues between $15 to $200 million ▪ Business & technology services, communications and healthcare ▪ North America ▪ Industry leader, experienced management, strong growth potential ▪ Large addressable market, high barriers to entry, acquisition opportunities	www.pamlicocapital.com
7	GS Growth	▪ Proven management team ▪ Strong financial track record and 20%+ annual revenue growth ▪ Large market opportunity	www.goldmansachs.com

		▪ Innovative technology or proprietary processes that create a sustainable competitive advantage	
8	Blue Heron Capital	▪ Differentiated product/service with a unique value proposition ▪ Significant revenue growth, preferably recurring revenue from an established customer base ▪ Defensible market position ▪ Large addressable market opportunity ▪ Identified growth catalysts ▪ Experienced management team that can manage growth and is open to advice ▪ > $2 million revenue ▪ Cash flow positive within 18 months	www.blue-heroncap.com
9	General Atlantic	▪ Strong market position and favorable industry structure ▪ Experienced, scalable management team with aligned incentives ▪ Deep, addressable and rapidly growing market ▪ Sustainable competitive advantage with intellectual property and high barriers to entry ▪ Proven, profitable and sustainable business model ▪ Identifiable levers for value-creation	www.generalatlantic.com
10	Sunstone Partners	▪ Driven leadership ▪ 10 million or greater revenues ▪ +20% Year-over-Year growth ▪ Profitable and a capital efficient history	www.sunstonepartners.com
11	IGP	▪ Niche manufacturers and industrial services businesses with strong market positions ▪ Revenue up to $250 million (although add-ons can be smaller) with a history of profitability ▪ Platforms headquartered in the U.S. or Canada (no geographic limits on add-ons)	www.ig-pequity.com
12	Azini Capital Partners	▪ Technology / technology enabled: We define “technology” quite broadly and have experience of investing and working in numerous sectors. However technology is a diverse, fast moving and innovative industry and we are comfortable to learn our way into new sectors. ▪ We look to work with businesses that have a defined and deliverable product / service offering and a proven business model that has been implemented and validated by multiple paying customers. We often talk about a minimum of $10 million of revenue but this measure will ultimately depend on the type of company and the products / services that it is offering. ▪ We like businesses that are cashflow generative but that is not a prerequisite. We recognise that fast growing companies need to reinvest and often require additional working capital to help accelerate their growth and development. We have invested fresh capital into significantly more than half of our portfolio companies. ▪ We like companies which have sustainable competitive advantage. This might be in the form of intellectual property and/or domain expertise. ▪ We like businesses which have international or global potential. ▪ We love working with great management.	www.azini.com
13	TA Associates	▪ Our extensive international team invests in companies across North America, Europe and Asia, providing access to a broad global network of resources. ▪ Our capital is commonly used to provide liquidity to shareholders, working capital for growth and/or financing for acquisitions.	www.ta.com

		▪ Our investments range from $50-$500 million in equity (less in Asia) and $10-$50 million in subordinated debt transactions that value businesses generally from $100 million - $3 billion. Our $24 billion raised and $7 billion in actively investing funds support your growth objectives. ▪ We take minority or majority positions typically ranging from 15% - 90%. We are always an active, value-added investor, generally working with management on key objectives at the board level; whatever ownership position, we leave the day-to-day operations to you. ▪ We are a long-term, patient growth investor looking to build value over time, with a holding period that has averaged more than 5 years over the past 15 years.	
14	Adams Street Partners	▪ Entrepreneurs want to work with investors who 'get it', and have a deep understanding of their business. To do this, we maintain a deep focus on two industries – technology and healthcare. ▪ We partner with exceptional teams building market-leading companies, and have the flexibility to invest at various stages of a company's life-cycle	www.adamsstreetpartners.com
15	Peloton Equity	▪ Demonstrated market adoption, typically represented by $20 - 200 million in revenue and/or $(5) - 10 million of EBITDA at investment. ▪ Provides higher quality care and/or lowers overall healthcare system costs. ▪ Well-positioned for transformational revenue and profit growth (3-5x over the life of the investment). ▪ Results-oriented culture with accomplished and experienced management. ▪ Peloton's team has successfully invested in similar businesses and/or has access to experts and customers to help the business achieve its growth objectives.	www.pelotonequity.com
16	Beechwood Capital	▪ $5-$50 Million of Revenue ▪ $1-$5 Million in EBITDA ▪ Open to discussing unique smaller businesses or pre-profitable growth-stage businesses ▪ Established proof of concept ▪ Existing management strength ▪ Defined branded/differentiated product or service that has the ability to disrupt large categories ▪ Targeting $1-$5 Million equity investments ▪ Typically Series A or B Rounds ▪ Willing to invest alongside like-minded private equity or venture groups	www.beechwoodcap.com
17	Arrowroot's Capital	▪ $5 million+ revenue run-rate ▪ Strong recurring revenue growth rate ▪ Proven, effective and efficient sales and marketing strategy ▪ Mission-critical, B2B software that typically solves a pain-point in compliance, workflow, security, and/or optimization	www.arrowrootcapital.com/
18	Spring Lake Equity Partners	▪ Successfully introduced a product or service to the market ▪ Demonstrated revenue growth with identified future growth catalysts ▪ Reached at least $8 million of revenue run rate ▪ High customer loyalty and repeat customer rates ▪ Achieved profitability or have a clear path to profitability ▪ Capital efficient business model and inherent scalability ▪ Core management team in place ▪ Attractive competitive dynamics	www.springlakeequitypartners.com

19	Silversmith Capital Partners	▪ Great entrepreneurs: Great companies are driven by the inspiration of great founders and entrepreneurs. Our job isn't to build great companies, it's to find those who do, and support them in any way that we can. ▪ Scale: greater than $10m revenue. We look for companies that are "through the tunnel". For these companies, the question is no longer "Can this be a business?" but rather "How big and important can this business be?" ▪ Growth: greater than 20%. Growth covers up for lots of sins. We believe in markets – when customers want to buy your product you are doing something right. ▪ Great entrepreneurs: In case we weren't clear – it's that important. ▪ Capital efficiency: That said, we believe the true test is being able to sell your product for more than it costs to build and deliver. Novel concept these days, but we think reaching breakeven / profitability speaks volumes about an entrepreneur.	www.silversmithcapital.com
20	Gemini Investors	▪ Companies with 3+ years of operating history ▪ Moderate to strong growth ▪ Revenues of $5 to $50 million ▪ EBITDA of at least $1 million ▪ Experienced management teams ▪ U.S. based ▪ $3 to $8 million target investment ▪ Willingness to co-invest with partners ▪ Control and minority transactions ▪ Flexible capital structure: subordinated debt and preferred equity	www.geminiinvestors.com

Source: Own illustration

Tab. A3: Interview guide

A Introduction

First of all I want to thank you for the opportunity to conduct this interview with you. As a small reward for your time, I will supply you with the main results of my study as soon as this study is finished, so that you can also profit from doing this interview.

Second, I want to introduce you to the topic of this interview. As part of my research I focus on the decision making of equity investors, like you, that are used for SMEs (small and medium sized enterprises) in the growth/expansion stage of their development. This means, I want you to imagine throughout the entire interview a later-stage venture that approaches you to seek money for their expansion capital. Therefore please do not think about a startup in their early stage or seed stage that needs money for their first product development or their first marketing activities. Please think about a company seeking money for expansion/growth with some of the following characteristics (examples) :

- Significant sales and orders ("market traction") + showing high-growth rates in sales & customers
- Willingness & need to enter new (int.) markets
- Proven technologies + Validated business model
- Complete management team and multiple employees (org. structure)

We will do a semi-structured interview, so that I will ask you mainly open-end questions and please answer openly and honestly. There is no wrong or right and if you have something in mind you want to say, please feel free to do so!

Of course your answers will be anonymized and we guarantee confidentiality.

B General characteristics of the decision maker (recorded)

- Name
- Gender (male/female)
- Function in the firm (investor)
- Type of investors
- Date of interview
- Location of investor

C Questions

For the first question please imagine again the kind of company I described to you in the beginning (company in the (int.) growth/expansion stage).

a) What raises your interest to further explore a company's potential for you as an investor when you receive a proposal for the first time (e.g., in the form of a teaser or business plan)?
b) What steps to you take to come to a judgment?
c) What factors to you analyze?

d) What do you look at?
e) What criteria's/factors are important to you / do you look at for companies in this stage of their development?
f) What are so called "knock-out" criteria's for you? What discourages you in a company in this stage?
g) What are reasons for rejection?
h) If you have decided to investigate the company / the proposal further (e.g., in the form of a meeting), what factors/criteria is then important to you? What factors to you analyze?
i) What are "knock-out" criteria's at this stage?
j) How many criteria's are you usually using?
k) Do you have anything you think that is important to know for a researcher when analyzing SME in the growth/expansion stage that seek money for int. growth?
l) Do you see a difference in seed or early stage criteria compared to later-stage criteria for companies?

Source: Own illustration

Tab. A4: Coding schema

Coding schema

A Decision process

- Stage
  - Deal origination
  - Generic screening
  - First screening
  - Evaluation
  - Due diligence
  - Deal closing
  - Post investment phase
- Duration

B Decision criteria

- Management team characteristics
  - Entrepreneur / Founder
    - Industry experience
    - Education
    - Personality
    - Track record
  - Team
    - Track record team
    - Composition of venture team
    - Size of the management team
    - Type of previous experience
    - Growth experience
- Financial characteristics
  - Exit
    - Strategy & type
    - Easiness of exit
  - Current & past financials
    - Revenue
    - Valuation
    - Growth
    - Margin
    - Profit
    - Cost
- Market characteristics
  - Competition
  - Market size
  - Market growth
  - Legal & Governmental constrains
  - Scope (narrow or broad market)
  - Suppliers & distributors
  - Timing of entry
  - Access to market
- Product characteristics
  - Uniqueness
  - Intellectual property

    - Profit margin / structural profitable
    - Post-entry barriers
    - Value add for customers
    - Unit economy
    - Quality of customers
- Internationalization / international scalability characteristics
    - Cost
    - Time
    - Strategy
    - Experience in foreign market
    - Foreign networks
- Business model characteristics
    - Design
    - Revenue generation
    - Risks
    - Flexibility
    - Industry KPIs
- Current investors characteristics
    - Reputation
    - Familiarity
    - Type of investor
    - Network
- KO-criteria

C Characteristics of later-stage venture vs. early-stage venture

Source: Own illustration

Tab. A5: Business model attribute and level description

Business model level	Description
Lock-in	Business model with the power to keep customers attracted and "locked-in". These business models have high switching costs for customers, which prevent them from changing to other providers (e.g., online marketplaces or social media platforms).
Innovation-centered	Business model that brings innovation in the form of new technology, products or services to consumers (e.g., new software technology or new materials).
Low cost	Business model focusing on reducing costs for customers for already existing products or services (e.g., low cost airlines or IT outsourcing services).
Complementary offering	Business model that bundles multiple goods or services to generate more value for customers (e.g., online travel agent that offers booking service, credit cards and travel insurance).

Source: Own illustration.

Tab. A6: Fixed task design

	Fixed task 1	
Attribute	**Growth venture 1**	**Growth venture 2**
Management team (track record)	No team member	Some team members
Current profitability	Not profitable	Profitable
Current revenue growth	50%	20%
Current investors	External investors - Unfamiliar	External investors - Tier 1
Business model	Innovation-centered	Lock-in
Value added for customers	High	High
International scalability	Difficult	Easy
Attribute	**Fixed task 2**	
	Growth venture 1	**Growth venture 2**
Management team (track record)	All team members	Some team members
Current profitability	Not profitable	Profitable
Current revenue growth	100%	20%
Current investors	No external investor	No external investor
Business model	Low cost	Lock-in
Value added for customers	Low	Medium
International scalability	Moderate	Moderate

Source: Own illustration.

Fig. A2: Element 1: Introduction page

ERASMUS UNIVERSITEIT ROTTERDAM Universität Trier

Investors' decision making when screening growth ventures

1. Introduction | 2. Decision scenarios | 3. Survey | 4. End

Dear Participant,

Thank you for participating in this unique study on **investors' decision making when screening growth ventures**.

This study is designed to take **15 minutes**. You will be confronted with several decision scenarios, where you will be asked to make screening choices about growth ventures. There are no right or wrong answers; the only thing that matters is your opinion.

As a reward for your participation you will receive the following:

- You will receive an exclusive benchmarking report on your decision making when screening growth ventures compared to other investors (that allows you to compare your responses to responses of your peers)
- You will receive specific insights on decision making by country, investor type and industry
- You will have access to a report that links the choices made to the financial performance of investors

We will donate 1€ for each completed questionnaire to one of three charitable projects of your choice.

Your response will help us to learn best practices in venture capital financing; it will also allow us to promote venture capital to policy makers and the public.

Thanks again for your support,

René Andres | Ph.D. Candidate - University of Trier
Prof. Dr. Jörn Block | Professor for Management - University of Trier & Erasmus University Rotterdam

To start the study, click the grey arrow below.

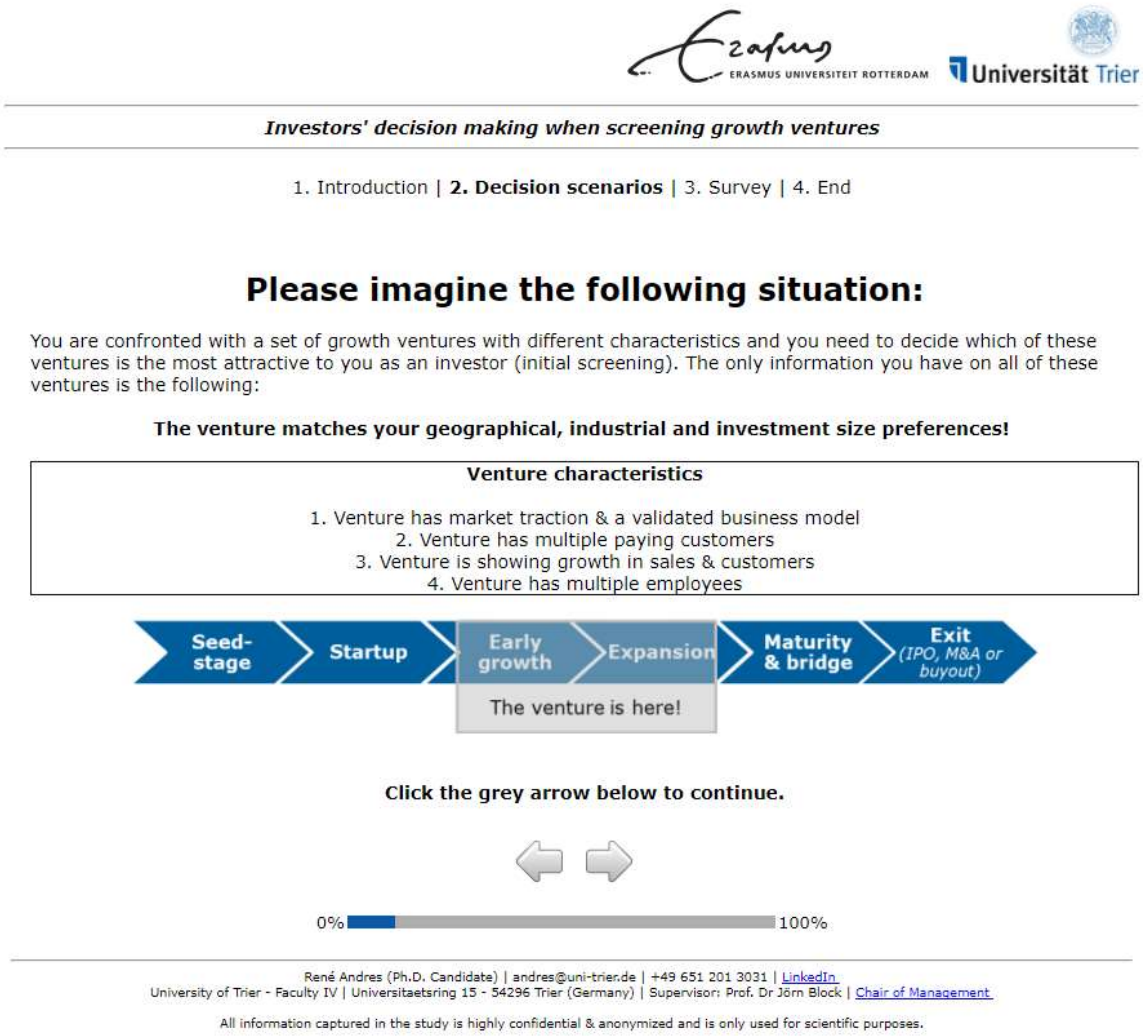
0% 100%

René Andres (Ph.D. Candidate) | andres@uni-trier.de | +49 651 201 3031 | LinkedIn
University of Trier - Faculty IV | Universitaetsring 15 - 54296 Trier (Germany) | Supervisor: Prof. Dr Jörn Block | Chair of Management

All information captured in the study is highly confidential & anonymized and is only used for scientific purposes.

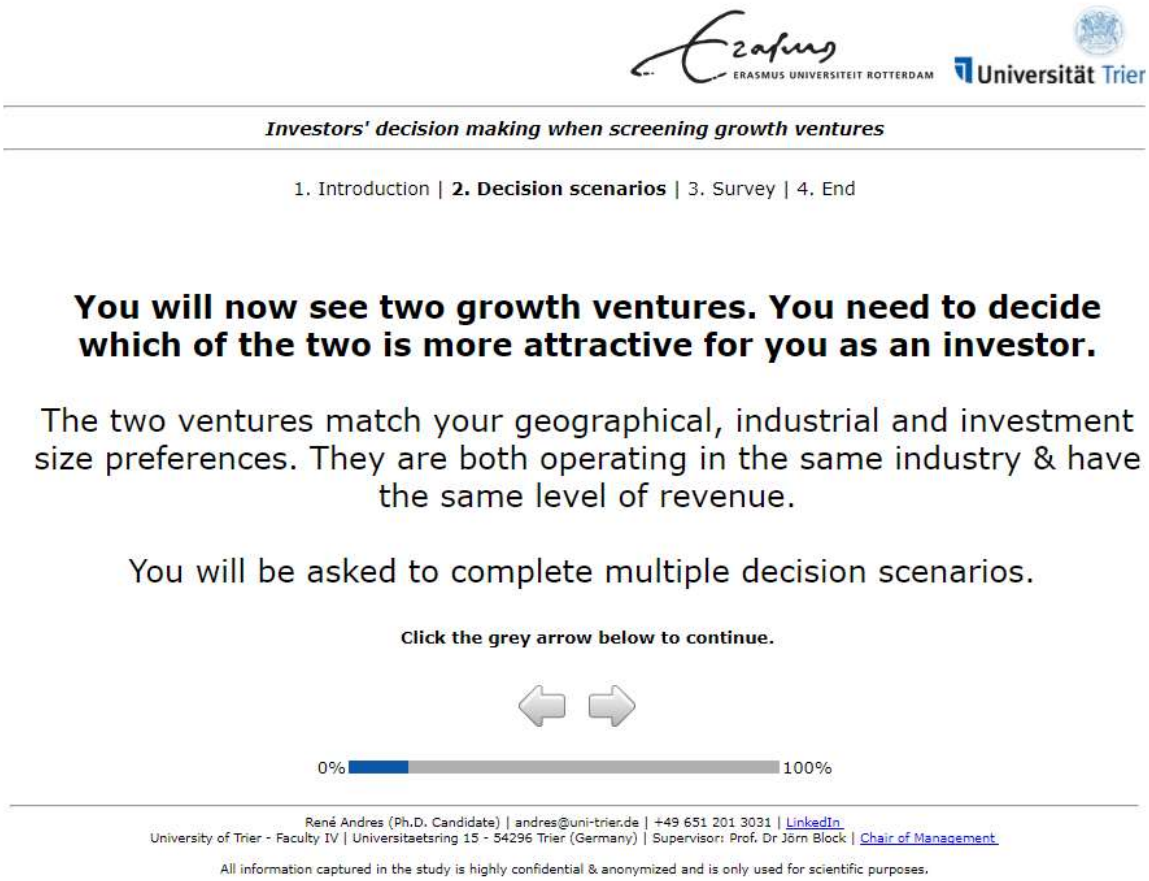
Source: Own illustration

Fig. A3: Element 2: Scenario explanation (1/2)



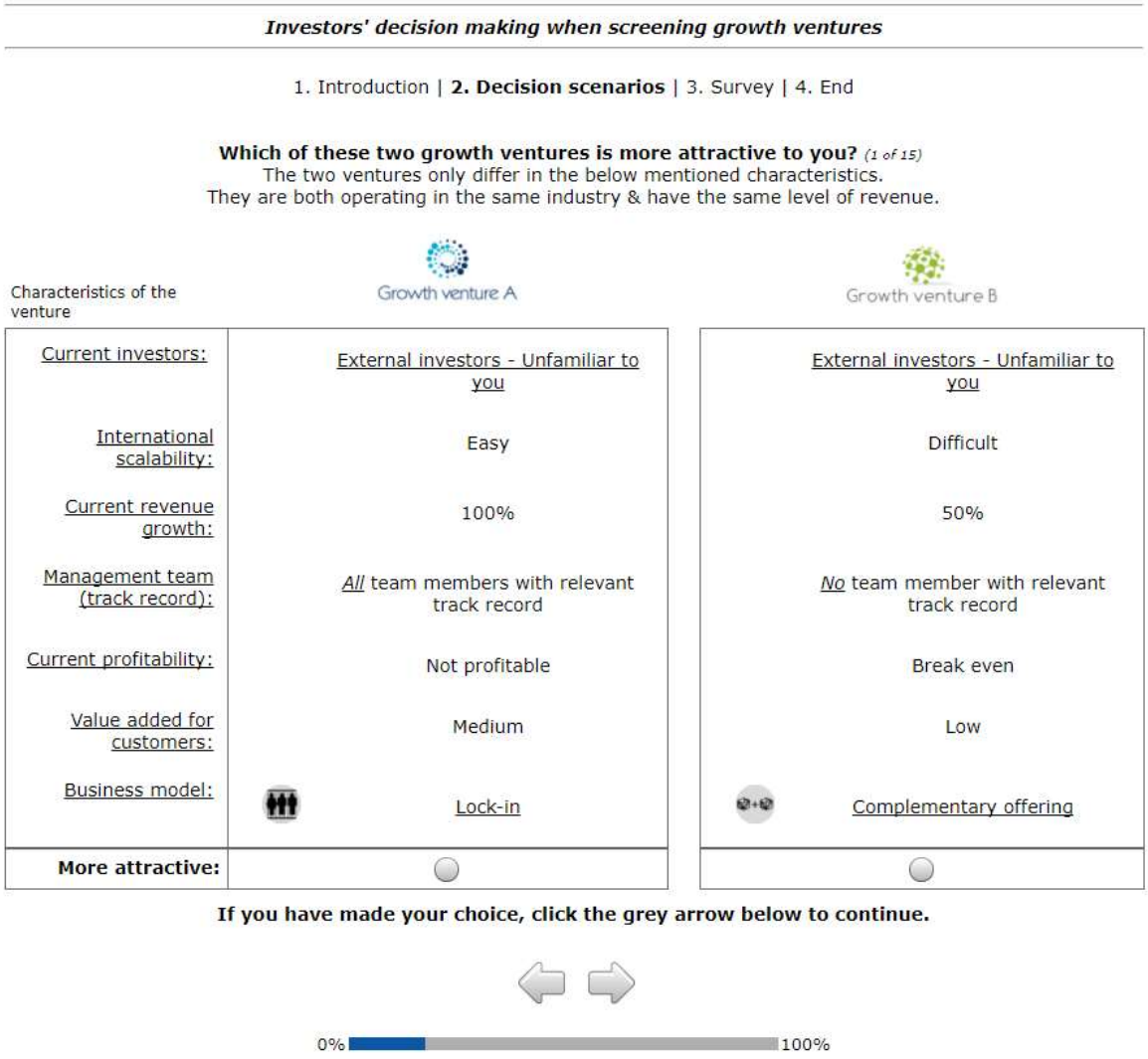
Source: Own illustration

Fig. A4: Element 2: Scenario explanation (2/2)



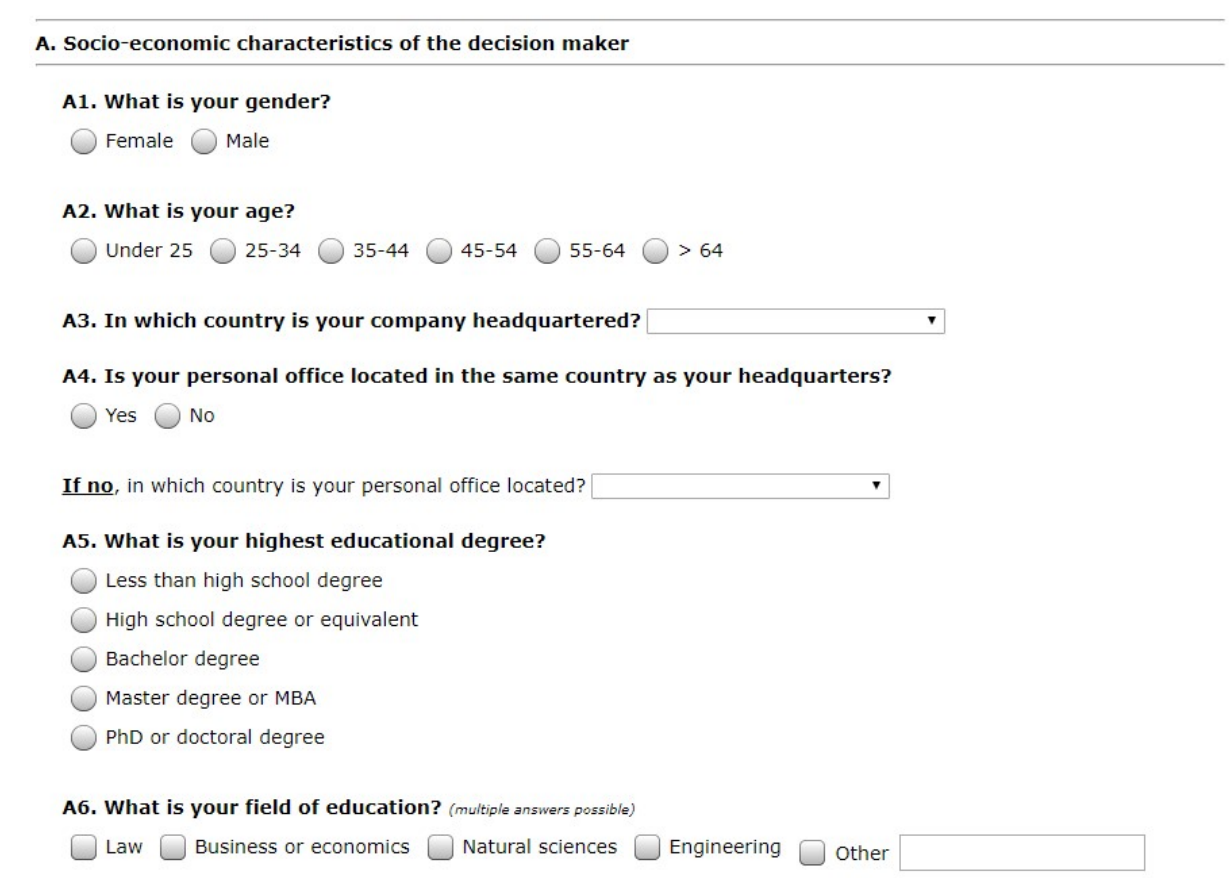
Source: Own illustration

Fig. A5: Element 3: Conjoint experiment



Source: Own illustration

Fig. A6: Survey elements (1/5)



A. Socio-economic characteristics of the decision maker

A1. What is your gender?

◯ Female ◯ Male

A2. What is your age?

◯ Under 25 ◯ 25-34 ◯ 35-44 ◯ 45-54 ◯ 55-64 ◯ > 64

A3. In which country is your company headquartered? ▾

A4. Is your personal office located in the same country as your headquarters?

◯ Yes ◯ No

If no, in which country is your personal office located? ▾

A5. What is your highest educational degree?

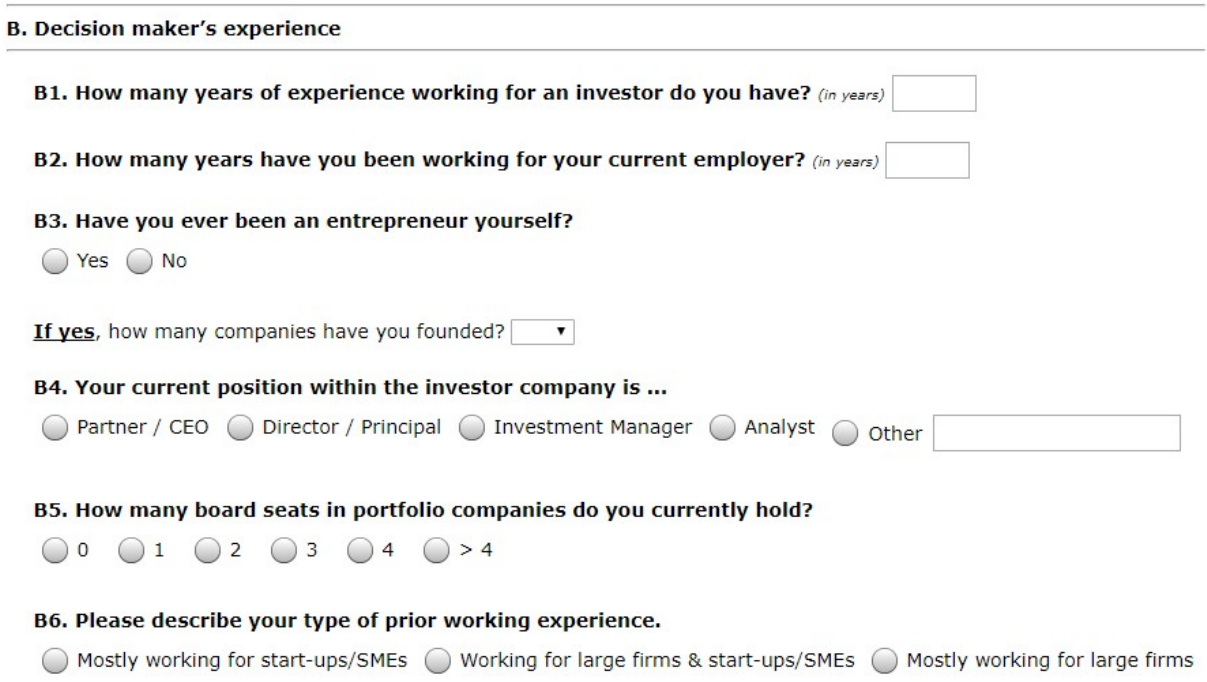
◯ Less than high school degree
◯ High school degree or equivalent
◯ Bachelor degree
◯ Master degree or MBA
◯ PhD or doctoral degree

A6. What is your field of education? *(multiple answers possible)*

☐ Law ☐ Business or economics ☐ Natural sciences ☐ Engineering ☐ Other

Source: Own illustration

Fig. A7: Survey elements (2/5)



B. Decision maker's experience

B1. How many years of experience working for an investor do you have? *(in years)*

B2. How many years have you been working for your current employer? *(in years)*

B3. Have you ever been an entrepreneur yourself?

Yes No

If yes, how many companies have you founded?

B4. Your current position within the investor company is ...

Partner / CEO Director / Principal Investment Manager Analyst Other

B5. How many board seats in portfolio companies do you currently hold?

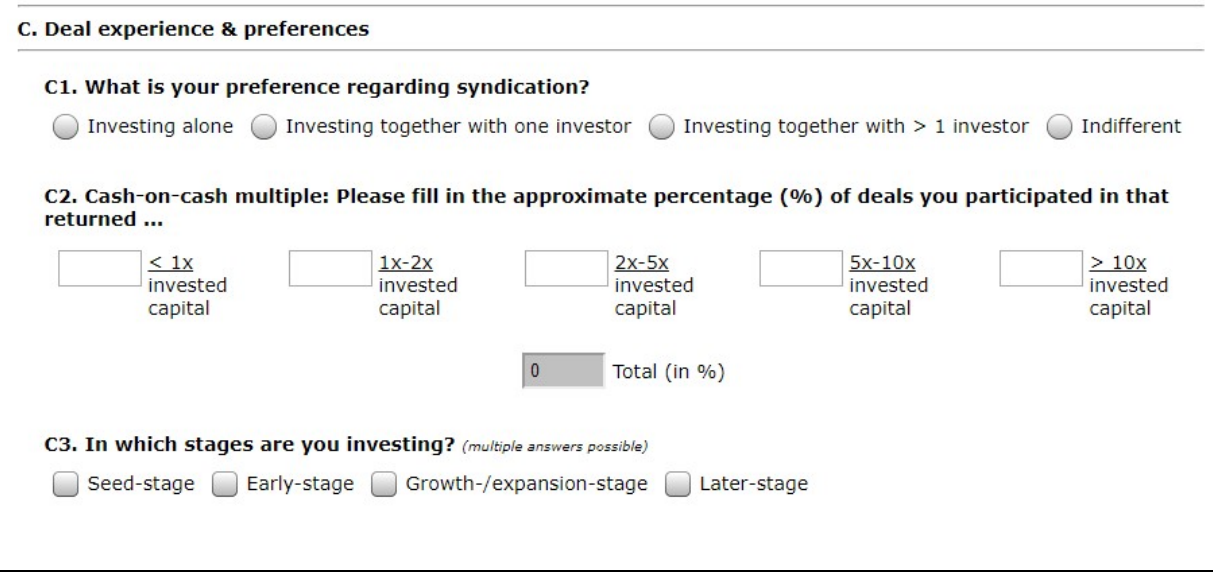
0 1 2 3 4 > 4

B6. Please describe your type of prior working experience.

Mostly working for start-ups/SMEs Working for large firms & start-ups/SMEs Mostly working for large firms

Source: Own illustration

Fig. A8: Survey elements (3/5)



C. Deal experience & preferences

C1. What is your preference regarding syndication?

Investing alone Investing together with one investor Investing together with > 1 investor Indifferent

C2. Cash-on-cash multiple: Please fill in the approximate percentage (%) of deals you participated in that returned ...

< 1x invested capital | 1x-2x invested capital | 2x-5x invested capital | 5x-10x invested capital | > 10x invested capital

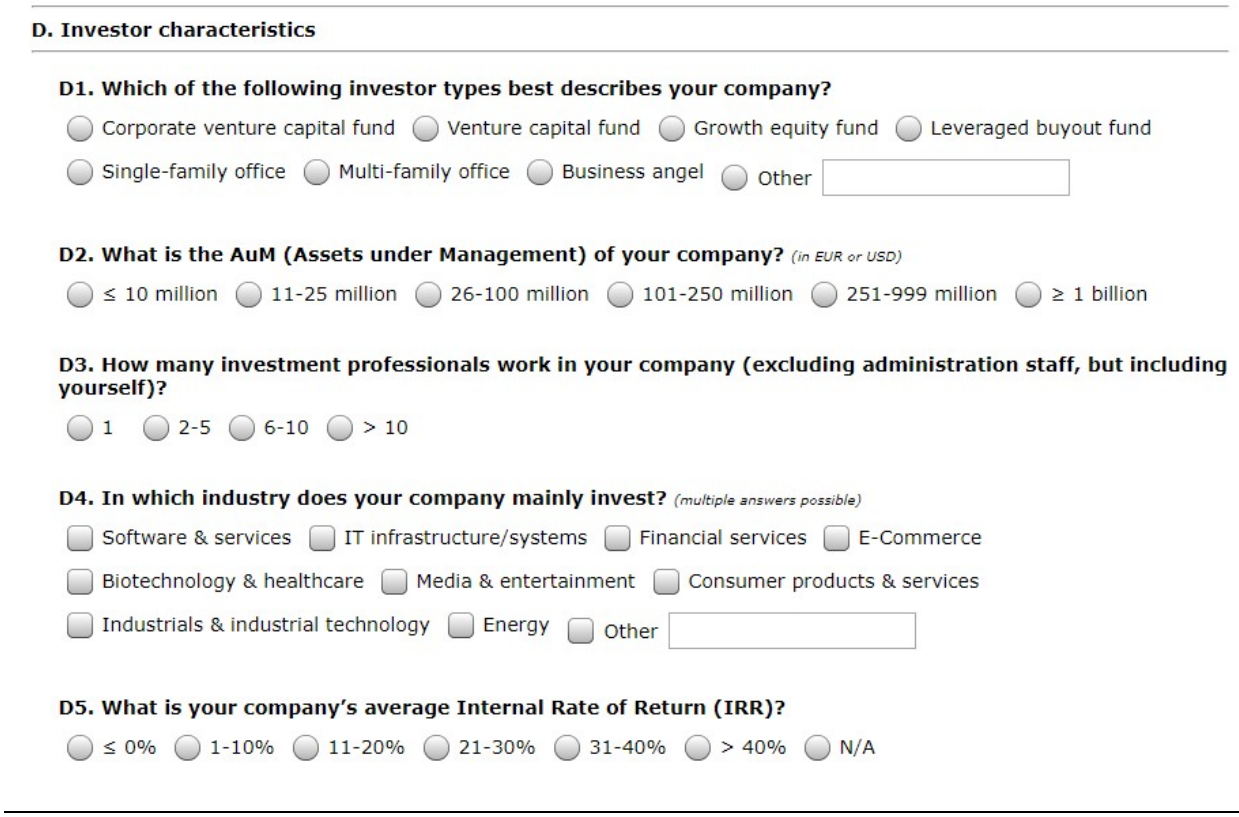
0 Total (in %)

C3. In which stages are you investing? *(multiple answers possible)*

Seed-stage Early-stage Growth-/expansion-stage Later-stage

Source: Own illustration

Fig. A9: Survey elements (4/5)



D. Investor characteristics

D1. Which of the following investor types best describes your company?

◯ Corporate venture capital fund ◯ Venture capital fund ◯ Growth equity fund ◯ Leveraged buyout fund

◯ Single-family office ◯ Multi-family office ◯ Business angel ◯ Other

D2. What is the AuM (Assets under Management) of your company? *(in EUR or USD)*

◯ ≤ 10 million ◯ 11-25 million ◯ 26-100 million ◯ 101-250 million ◯ 251-999 million ◯ ≥ 1 billion

D3. How many investment professionals work in your company (excluding administration staff, but including yourself)?

◯ 1 ◯ 2-5 ◯ 6-10 ◯ > 10

D4. In which industry does your company mainly invest? *(multiple answers possible)*

☐ Software & services ☐ IT infrastructure/systems ☐ Financial services ☐ E-Commerce

☐ Biotechnology & healthcare ☐ Media & entertainment ☐ Consumer products & services

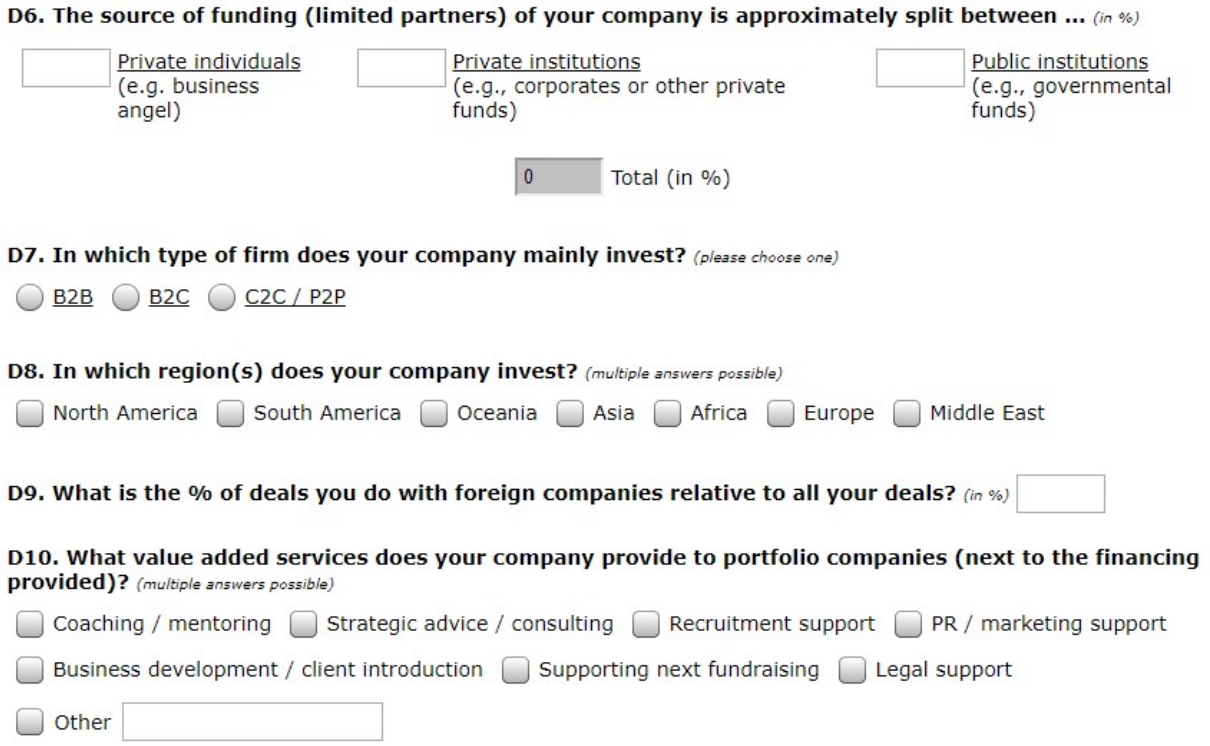
☐ Industrials & industrial technology ☐ Energy ☐ Other

D5. What is your company's average Internal Rate of Return (IRR)?

◯ ≤ 0% ◯ 1-10% ◯ 11-20% ◯ 21-30% ◯ 31-40% ◯ > 40% ◯ N/A

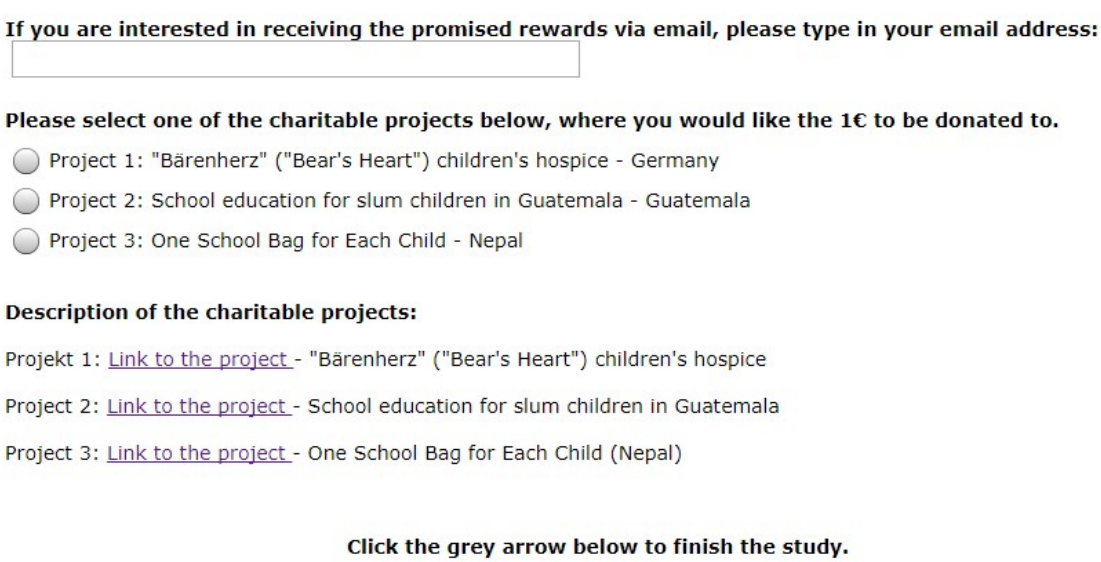
Source: Own illustration

Fig. A10: Survey elements (5/5)



Source: Own illustration

Fig. A11: Survey ending



Source: Own illustration

Fig. A12: First invitation email

Dear [Name] [Surname],

Do you want to know how your international peers evaluate & screen later-stage ventures?
If yes, I am inviting you to take part in a study on decision making when screening later-stage ventures. My name is René Andres and I am currently conducting academic research at the University of Trier (Germany) in the context of my Ph.D.

What is the study about?

The purpose of my research is to study investors' decision-making behavior when screening later-stage ventures. This research tries to contribute to the investor community by linking investors' decision-making behavior to their financial performance. This will allow investors to gain deeper insights into decision-making criteria in later-stage ventures. In order to do this, I am employing a special method that simulates decision scenarios for investors. The study is focusing on multiple investor types, including VCs, CVCs, PEs (growth & buyout) and family offices.

Why should you take part (benefits)?

- You will receive an exclusive benchmarking report on your decision making when screening later-stage ventures compared to other investors (that allows you to compare your responses to responses of your peers)
- You will receive specific insights on decision making by country, investor type and industry
- You will have access to a report that links the choices made to the financial performance of investors

We will donate 1€ for each completed questionnaire to one of three charitable projects of your choice.

This study is designed to take **15 minutes**. Please click the following link to start the study:

Start the study.

All information captured in this study is **highly confidential & anonymized** and is only used for scientific purposes. Due to the study's selection process & type of individual study, multiple investment professionals from your firm have been invited to participate.

If you have any questions, please feel free to contact us.

Source: Own illustration

Fig. A13: First reminder email

Dear [Name] [Surname],

we hope you are doing well! A few weeks ago, we sent you an invite to our study on decision making of investors. I'm sure you must be really busy, so we don't want to seem interrupting.

But when you get a chance and can find a few minutes on this, we would highly appreciate your participation! Please find here again the link to start the study (it will take you approx. 15min):

Start the study.

Find below again all information related to the study, including the benefits for taking part. If you have already taking part in the meantime, please ignore this email.

All the best,

René Andres

Source: Own illustration

Fig. A14: Second reminder email

Dear [Name] [Surname],

We hope you are doing well! A few weeks ago we sent you a new invite to our study on decision making of investors. I'm sure you must be really busy, so we don't want to seem interrupting.

When you get a chance, we would highly appreciate your participation in our study! So far > 500 investors have participated. Find at the end of the email all information related to the study, including the benefits for taking part. Here again the link to start the study (it will take you approx. 10-15min):

Start the study.

Find below again all information related to the study, including the benefits for taking part. If you have already taking part in the meantime, please ignore this email.

All the best,

René Andres

Source: Own illustration

Fig. A15: Third reminder email

Dear [Name] [Surname],

We hope you are doing well! A few weeks ago we sent you a new invite to our study on decision making of investors. I'm sure you must be really busy, so this will be the last reminder on this matter.

When you get a chance, we would highly appreciate your participation! So far many hundreds of investors have participated. Find at the end of the email all information related to the study, including the benefits for taking part. This is the last reminder as the study will end in one week, so no further follow-up email will follow. Here the link to start the study (it will take you approx. 10-15min):

Start the study.

Find below again all information related to the study, including the benefits for taking part. If you have already taking part in the meantime, please ignore this email.

All the best,

René Andres

Source: Own illustration

Tab. A7: Logit regression model – data quality tests

Variable	**Logit model** *(clustered standard errors on individual level)*
Gender	-0.000480
	(0.000482)
Age (25-34)	-0.000200
	(0.000384)
Age (35-44)	0.000551
	(0.000630)
Age (45-54)	0.000719
	(0.000773)
Age (55-64)	0.000712
	(0.000788)
Age (>64)	0.000247
	(0.000581)
Educational background (law)	-0.000935
	(0.000889)
Educational background (business or economics)	-0.00177
	(0.00163)
Educational background (natural science)	-0.00310
	(0.00285)
Educational background (engineering)	-0.00182
	(0.00167)
Experience as investor	0.00000292
	(0.0000127)
Tenure	-0.0000136
	(0.0000176)
Entrepreneurial experience	0.000224
	(0.000249)
Position in the firm (Director or Principal)	0.000412
	(0.000420)
Position in the firm (Investment Manager)	-0.000892
	(0.000850)
Position in the firm (Analyst)	0.000543
	(0.000560)
Board seats	-0.000119
	(0.000115)
Leadership experience (working in large firms & startups or SMEs)	0.000784
	(0.000732)
Leadership experience (mostly in large firms)	0.00105
	(0.000972)
Syndication preference (Investing together with one investor)	0.000255
	(0.000292)
Syndication preference (Investing together with > 1)	-0.000704
	(0.000672)
Syndication preference (Indifferent)	-0.0000989
	(0.000197)
Investor type (VC)	0.00135
	(0.00128)
Investor type (Growth equity fund)	0.00140
	(0.00132)
Investor type (buyout fund)	0.00128
	(0.00123)
Investor type (family office)	0.00165
	(0.00157)
Investor type (angel)	0.00220
	(0.00209)
Investor type (venture debt fund)	0.000544

	(0.000691)
Assets under management (11m-25m)	-0.0000715
	(0.000300)
Assets under management (26m-100m)	-0.000160
	(0.000300)
Assets under management (101m-250m)	-0.000876
	(0.000859)
Assets under management (251m-999m)	-0.000114
	(0.000330)
Assets under management (more than 1bn)	-0.000437
	(0.000515)
Staff (2-5)	-0.000190
	(0.000569)
Staff (6-10)	-0.000978
	(0.00106)
Staff (more than 10)	-0.000150
	(0.000596)
Industry: Software & services	0.000266
	(0.000295)
Industry: IT infrastructure/systems	0.000367
	(0.000360)
Industry: Financial services	-0.000122
	(0.000178)
Industry: E-Commerce	0.0000764
	(0.000152)
Industry: Biotechnology & healthcare	0.000610
	(0.000574)
Industry: Media & entertainment	-0.000000331
	(0.000134)
Industry: Consumer products & services	-0.000202
	(0.000223)
Industry: Industrials & industrial technology	-0.0000578
	(0.000158)
Industry: Energy	-0.00120
	(0.00111)
Limited partner structure (Private individuals)	-0.00000431
	(0.00000463)
Limited partner structure (Private institutions)	0.000000625
	(0.00000223)
X2X: B2C	0.000385
	(0.000387)
X2X: P2P	0.000539
	(0.000634)
Cross-border deals	-0.0000110
	(0.0000102)
Value-added-services: Coaching / mentoring	0.000751
	(0.000707)
Value-added-services: Strategic advise	-0.000742
	(0.000722)
Value-added-services: Recruitment support	0.000207
	(0.000238)
Value-added-services: PR / marketing support	0.0000114
	(0.000137)
Value-added-services: Business development support / client introduction	-0.000412
	(0.000409)
Value-added-services: Support next fundraising	0.000961
	(0.000893)
Value-added-services: Legal support	-0.0000338
	(0.000153)
Formal education	0.000265

	(0.000272)
Region: North America	-0.000264
	(0.000288)
Region: South America	-0.000444
	(0.000533)
Region: Asia	0.0000698
	(0.000255)
Region: Oceania	0.0000517
	(0.000395)
Region: Africa	0.000622
	(0.000698)
<1x CoC Multiple	-0.0000145
	(0.0000159)
1x-2x CoC Multiple	-0.0000122
	(0.0000139)
2x-5x CoC Multiple	-0.00000778
	(0.0000108)
5x-10x CoC Multiple	0.00000362
	(0.0000103)
Constant	0.000995
	(0.00155)
N	19,474
pseudo R^2	0.000
Wald χ^2	1.20

*Note: Standard errors in parentheses; * p < 0.05, ** p < 0.01, *** p < 0.001*

Source: Own illustration.

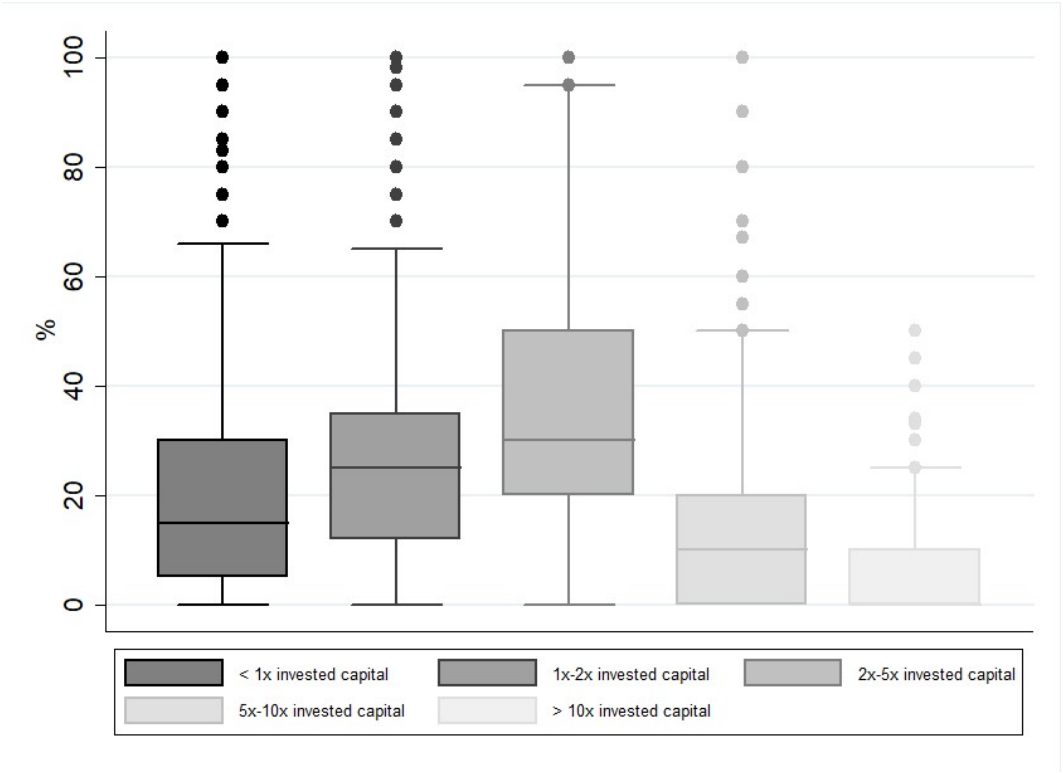
Tab. A8: Investor type split up

Variable	Number of participants and proportion on sample
Investor type (CVC)	66 8.81%
Investor type (VC)	330 44.06%
Investor type (Growth equity fund)	189 25.23%
Investor type (buyout fund)	73 9.75%
Investor type (family office)	59 7.88%
Investor type (angel)	20 2.67%
Investor type (venture debt fund)	12 1.60%
N	749
%	100%

Note: Family offices include both single- and multi-family offices

Source: Own illustration.

Fig. A16: Performance index distribution (boxplot)

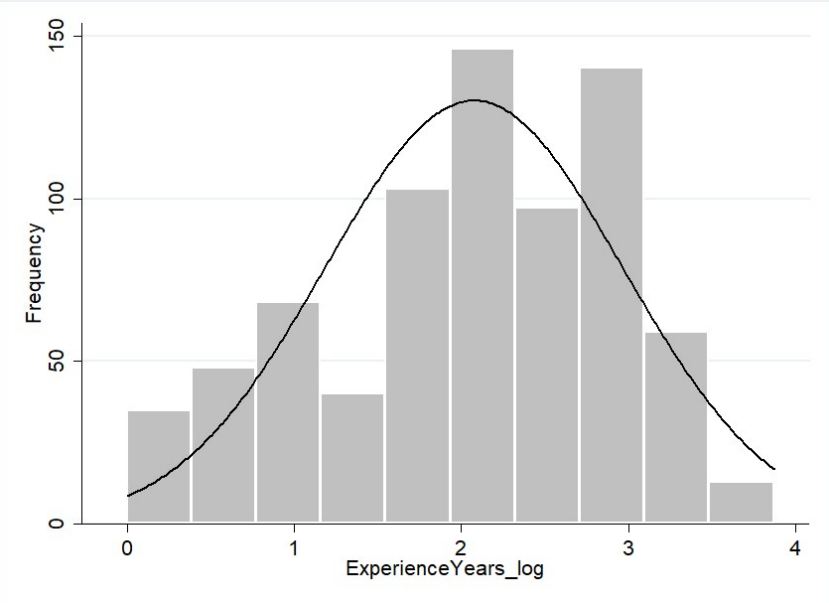


Source: Own illustration

Tab. A9: Correlation table (individual level variables)

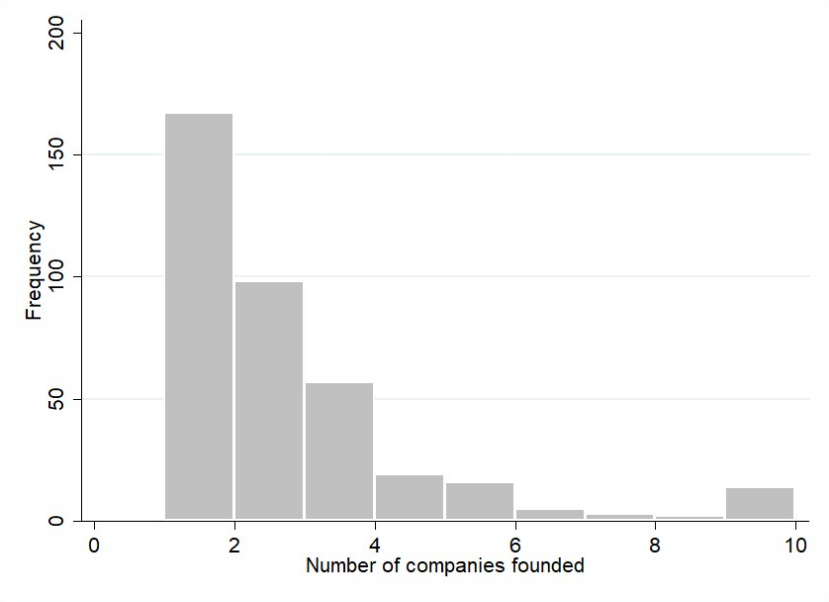
Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1) Gender	1.00																				
2) Age	0.16	1.00																			
3) Experience as investor	0.17	0.72	1.00																		
4) Tenure	0.13	0.56	0.63	1.00																	
5) Entrepreneurial experience	0.13	0.37	0.30	0.13	1.00																
6) Educational background (law)	0.02	0.09	0.06	0.06	0.04	1.00															
7) Educational background (business or economics)	-0.00	-0.17	-0.01	-0.09	-0.13	-0.10	1.00														
8) Educational background (natural science)	-0.05	0.07	0.00	0.05	0.05	-0.07	-0.40	1.00													
9) Educational background (engineering)	0.05	0.07	-0.03	-0.03	0.06	-0.14	-0.31	-0.08	1.00												
10) Position in the firm	-0.15	-0.60	-0.49	-0.39	-0.42	-0.10	0.11	-0.00	-0.09	1.00											
11) Board seats	0.11	0.44	0.39	0.34	0.30	0.05	-0.09	0.02	0.10	-0.55	1.00										
12) Leadership experience (mostly in startups or SMEs)	0.01	-0.04	-0.00	0.06	0.11	0.04	-0.08	0.12	-0.05	0.04	-0.02	1.00									
13) Leadership experience (working in large firms & startups or SMEs)	0.05	0.09	0.07	-0.04	0.16	-0.06	0.04	-0.07	0.05	-0.13	0.07	-0.48	1.00								
14) Leadership experience (mostly in large firms)	-0.06	-0.06	-0.07	-0.01	-0.26	0.03	0.03	-0.04	-0.00	0.09	-0.06	-0.44	-0.58	1.00							
15) Individual performance	0.05	-0.08	-0.04	-0.08	0.04	-0.02	0.06	-0.03	-0.04	0.02	-0.04	-0.10	0.10	-0.01	1.00						
16) Formal education	-0.07	0.22	0.07	0.15	0.07	0.13	-0.16	0.24	0.05	-0.22	0.14	0.05	-0.03	-0.02	-0.13	1.00					
17) <1x CoC Multiple	-0.04	0.16	0.11	0.13	0.09	0.00	-0.13	0.09	0.08	-0.10	0.13	0.15	-0.05	-0.09	-0.75	0.13	1.00				
18) 1x-2x CoC Multiple	-0.02	-0.08	-0.06	-0.03	-0.11	0.06	0.07	-0.06	-0.06	0.07	-0.05	-0.02	-0.07	0.09	-0.37	0.02	-0.21	1.00			
19) 2x-5x CoC Multiple	0.02	-0.09	-0.07	-0.10	-0.08	-0.06	0.06	-0.05	-0.04	0.06	-0.12	-0.13	0.07	0.05	0.51	-0.08	-0.56	-0.45	1.00		
20) 5x-10x CoC Multiple	0.04	-0.01	0.00	0.02	0.08	-0.02	-0.04	0.03	0.02	-0.03	0.06	0.04	0.03	-0.07	0.57	-0.04	-0.18	-0.31	-0.17	1.00	
21) >10x CoC Multiple	0.01	0.09	0.08	0.02	0.16	0.04	0.00	0.03	0.01	-0.07	0.09	0.01	0.07	-0.08	0.43	-0.05	0.00	-0.20	-0.25	0.22	1.00

Fig. A17: Years of experience as investor (logarithm)



Source: Own illustration based on data from 749 participants.

Fig. A18: Number of ventures founded



Source: Own illustration based on data from 380 participants.

Eidesstattliche Erklärung

Hiermit erkläre(n) ich (wir), dass ich (wir) die Arbeit selbständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt und die aus fremden Quellen direkt oder indirekt übernommenen Gedanken als solche kenntlich gemacht habe(n). Die Arbeit habe(n) ich (wir) bisher keinem anderen Prüfungsamt in gleicher oder vergleichbarer Form vorgelegt. Sie wurde bisher auch nicht veröffentlicht.

_____

Datum

_____

René, Andres