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VC valuation and multiples: an exploration of comparable analysis of software start-ups

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Abstract

This master thesis seeks to better understand the investment valuation procedure followed by software venture capitalists (VC) in the European context. I explain how VCs perform fair value estimations of software start-ups with the emerging comparable analysis technique. Furthermore, this study examines the relative importance of start-up characteristics in determining the multiple and how these factors influence the VC's valuation behaviour. Additionally, I explore whether this behaviour and the multiples paid can be explained by differences in VC firm experience at a time of historically low interest rates and record-breaking fund inflows. Based on 36 interviews with European VCs, primarily from the Benelux region, I find that all start-up characteristics matter in the determination of the multiple, but the management team a little more. As a result, software VCs are willing to pay higher multiples for stellar management teams than for exceptional business characteristics. In contrast with the other characteristics, poor traction does not necessarily kill the deal, but VCs might rather use it to enforce a lower valuation. Overall, VC firm experience is not a strong predictor of the valuation behaviour and ARR multiples paid for deals. However, I do show that more experienced VCs are willing to pay higher premiums for benchmark-exceeding traction than their less experienced counterparts.

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Fluctuat nec mergitur – It is tossed by the waves but it does not sink.

I am more than happy that I took the risk to switch faculties and pursue a master program in Management of Technology. At first, many people were sceptical; however, I knew it was the right choice. As much as I enjoyed civil engineering, I did not see myself working in this industry. My passion lay elsewhere. I have always been enthusiastic about ground-breaking technology, entrepreneurship, and finance. Hence, it was a great experience to combine all everything into one research project. I want to thank my first supervisor, Dr. Aleksandar Giga, for his support during the research project. I highly appreciate every helpful suggestion and constructive feedback during the preparation of this thesis. Along the way, Aleksandrina Ralcheva, Dr. Victor Scholten, and Prof. Dr. Cees van Beers were great supporters as well, and I would like to express my special thanks to you all. I am very grateful for your precious input and inspiring criticism, which improved the outcome of this thesis without a doubt.

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Acronyms

VC	Venture capital(ist)
GPs	General Partners
ROI	Return on investment
ARR	Annual Recurring Revenue
LPs	Limited partners
GDP	Gross domestic product
DCF	Discounted Cash Flow
EV	Enterprise Value
ROA	Return on Assets
P/E	Price to earnings
EBIT	Earnings before interest and taxes
EBITDA	Earnings before interest, taxes, depreciation, and amortisation
PE	Private Equity
SaaS	Software as a Service
IP	Intellectual property
IPO	Initial Public Offering
USP	Unique Selling Point
HNWI	High Net Worth Individuals
FCF	Free Cash Flow
CLV	Customer Lifetime Value

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1 Introduction

Theoretically, start-ups can be valued as any other economic good by summing up the present values of future cash flows. However, valuing entrepreneurial firms is often more challenging because of the high uncertainty, the option-like nature, and the missing financial track record (Vanacker & Manigart, 2013). Nonetheless, business' fair value estimation is becoming increasingly important to international accounting authorities (IPEV, 2018) in the venture capital (VC) industry. Reason for this is that mistakes in the fair value estimation have apparent consequences for the entrepreneur, the VC's general partners (GPs), and the investors in the VC fund. For example, if the VC undervalues a start-up's shares, the existing shareholders will be overdiluted which directly impacts the firm's control structure (Cumming & Dai, 2011) and the VC will not stay competitive for the good deals. On the other side of the spectrum, overvaluation may negatively impact the VC's return on investment (ROI) and reputation. This is because the likelihood of a down round is higher when a company is over-hyped from a valuation standpoint. As a result, it is in the entrepreneur's and VCs' interest to predict the estimated fair value of businesses as accurately as possible. For this purpose, comparable analysis is often used in both emerging and mature VC markets (Dittmann, Maug, & Kemper, 2004; Manigart et al., 2000; Paliard et al., 2001; Pintado, de Lema, & Van Auken, 2007; Reverte, Sánchez-Hernández, & Rojo-Ramírez, 2016) which the results of this study confirm.

Understanding the VC investment valuation procedure is particularly relevant for entrepreneurs who submit funding proposals to VCs. Through this research, entrepreneurs will better understand how VCs value their business and what start-up and VC characteristics (hereafter, factors) are important in the valuation decision of early-stage investors. On top of that, they will also find out how these factors influence VC valuation behaviour and what factors to leverage in valuation negotiations. On the other hand, early-stage investors will learn how other VCs value start-ups with the emerging comparable analysis technique. This is particularly relevant because private investors have few reference points. As a result, they determine fair value estimates solely based on their personal judgment. With the help of this research, VCs will find out how other firms determine the multiple used for deals and what other VCs' value perception is of the factors studied.

Despite the practical relevance, little has been written about the valuation procedures of VCs with comparable analysis and how various factors influence the multiple used for deals. So, this research seeks to better understand how software investors arrive at this multiple. Therefore, I explore (1) how VCs pick comparable companies or transactions, (2) what the relative importance is of factors in determining the multiple used to value businesses, (3) how the valuation behaviour of VCs changes according to the perceived favourability of factors, and (4) whether this behaviour and the multiples paid correlates with VC firm experience at the time of historically low interest rates and record-breaking fund inflows. To operationalise this objective, the research question (RQ) is posed as follows:

RQ	What is the relative importance of factors in determining the multiple of software start-ups

The empirical basis of this research is the completed questionnaires of 36 European software VC firms, predominantly located in the Benelux region. The questionnaire was highly structured and

mimicked the different steps of comparable analysis as described in theory. On the one hand, quantitative data on factor importance and valuation behaviour was collected for each investment stage by means of closed-end questions. On the other hand, I also posed open-ended questions to collect qualitative data on comparable company/transaction selection and expand on the answers of the closed-end questions. The factors studied in my research are based on the 5M framework of PwC Raise Ventures (Waters, 2021) and comprises momentum (traction of the business and financial information), market, technology, management and money (funding need, previous valuations, exit considerations, and the potential return on investment).

I find that most VCs select comparable companies in an unstructured way. The majority relies on preselected sets of comparables in designated VC & M&A databases, such as Dealroom.co, Crunchbase, Preqin, and Pitchbook. Others use the so-called circle approach, in which the number of selection criteria is systematically reduced until the VC has produced a representative set of comparable companies. In this process, VCs lay the greatest emphasis on specific sector (e.g., industry and industry vertical) and business characteristics (e.g., business model, product, etc.) as selection criteria. Selections based on similar performance and financial metrics are less common. VC & M&A databases are not only a great help in finding comparables, but they are also used by half of the VCs in the sample to track down the financial information of the selected comparable companies. However, the information on comparable companies seems to be highly fragmented. Especially for comparable transactions, there is not one source from which VC retrieve all the necessary information. Therefore, fellow VCs, websites and news outlets, internal databases, and public company information are sporadically consulted.

While most VCs seek to invest in firms with an excellent business and competent management team, some claim to favour one over the other (Kaplan, Sensoy, & Strömberg, 2009). I find that all factors matter in terms of valuation, but the management team just a little more. Momentum stands in second place, trailed by market and technology, which are almost equally value relevant. Money is the least important factor in the valuation decision of VCs. As a result, software VCs are willing to pay higher premiums for great management teams than other exceptional factors. Despite market, technology, and management mostly being deal-breakers when perceived as unfavourable, VCs leverage poor momentum and money as negotiating factors to enforce a lower valuation. Although VCs with more funds under management are willing to pay higher premiums for significantly above average momentum, I find no strong evidence that VC firm experience predicts the valuation behaviour for other factors and the average annual recurring revenue (ARR) multiples paid in an economic environment with historically-low interest rates, record-breaking capital allocation to private markets, and high market valuations.

This master thesis proceeds as follows. Chapter 2 provides background information on VC, the European ecosystem, VC deal-making, and comparable analysis. Chapter 3 reviews the current state of the literature on the different factors and comparable analysis which led to the formulation of the research objective and the main research question. Subsequently, I will extensively discuss the methodology of this study in chapter 4. This research is built upon a mixed-methods research strategy and an embedded research design. The justification and the reasoning behind using a mixed-methods strategy are presented in section 4.1. Section 4.2 highlights the research design, explaining the interview procedure and the questionnaire. The data analysis approaches for both the quantitative and qualitative data are defined in section 4.3. Finally, the results of this study are discussed in chapter 5, and chapter 6 contains the discussion and conclusion of this thesis.

2 Background information

With this chapter, I aim to make this study understandable and more enjoyable to read for people without prior knowledge of venture finance, VC, and start-ups in general. First, I will briefly explain the concept of a start-up. Subsequently, the concept of VC will be discussed, including VC deal-making and the role of valuation and valuation models in this process. After that, I will elaborate on the current state of the European VC ecosystem and place it in the broader global context.

Today, no broadly accepted definition of a start-up exists (Bormans, Privitera, Bogen, & Cooney, 2019; Montani, Gervasio, & Pulcini, 2020). However, a commonly used definition in the literature is formulated by Reis (2011). He describes a start-up as "a human institution designed to create a new product or service under extreme uncertainty" (Reis, 2011, p. 27). As a result, a start-up is essentially a business experiment. So, it should not surprise that many start-ups go down before reaching their economic potential despite having a fundamentally good idea (Crowne, 2002). This is because they are putting assumptions to the test, and these assumptions are probably wrong, meaning that start-ups are prone to failure by definition. Damodaran (2009) concludes that only 31% of American start-ups are still around after seven years of operations, whereas others mention a 70% failure rate until the end of year 10 (Kotashev, 2022). Because these companies are still developing their product or service, they have relatively small revenues and high operating losses. Early-stage investors are not interested in any business. Only companies actively looking for scale and exponential growth of revenues the interest of private investors. As a result, VCs do not invest in brick-and-mortar or professional service businesses such as consulting firms.

The continuous drive to scale makes start-ups heavily dependent on external capital sources such as friends and family, angel investors, VCs, and government grants. For European start-ups in the earliest stages of development, VCs are for 10% the most frequent sources of finance, whereas this percentage gradually increases up to 30% for late-stage start-ups (Bormans et al., 2019). Other prevalent funding sources are government subsidies for 40% and business angels for 20-30%. This shows that VCs are one of the most important funding providers in the European start-up ecosystem. But what is a VC exactly? Essentially it is a firm led by financial professionals who operate as middlemen by investing other people's money into start-ups (Bonnet & Wirtz, 2012; Vanacker & Manigart, 2013). They make these investments from a fund that they raise from a wide variety of investors such as wealth managers, family offices, commercial banks, pension funds, etc. These people or institutions are called limited partners (LPs).

Typically, VCs specialise in specific investment stage (Pintado et al., 2007) or geographical region which they use to profile themselves in the VC market. By specialising, they can balance investment risk, portfolio diversification, and return potential better (Pintado et al., 2007). Generally speaking, there are three types of VCs: seed-stage VCs, early-stage VCs, and late-stage VCs. Seed-stage VCs invest in start-ups in the earliest stages of development. Usually, these start-ups have just begun developing and validating an idea or concept, researching the market opportunity, and defining the business model (Metrick & Yasuda, 2021; Picken, 2017). As a result, seed-stage start-ups have little or no market traction resulting in yearly revenues between zero and one million (Van Laere, 2020). Early-stage VCs join the investor table once the start-up starts testing their product or service in the market (Metrick & Yasuda, 2021). However, the risk remains high as the start-up's business plan is not necessarily proven to be effective, especially not at scale. Nonetheless, early-stage start-up usually have a turnover of at least one million (Van Laere, 2020), proving their first market traction. Late-stage VCs start investing once the start-up

transitions to the scaling phase and has a fast-growing revenue of five million or more (Van Laere, 2020). In this phase, entrepreneurs use considerable resources to scale the validated business concept in new markets (Picken, 2017) and fund further product improvements (Metrick & Yasuda, 2021). The risk of investing in late-stage start-ups is still relatively high because it is often too early to tell if the company will be successful in the long run (Caselli, 2022).

Over the previous few decades, the VC business has grown tremendously in Europe and Asia (Vanacker & Manigart, 2013). The total funds raised by European VC investors was €15.5bn in 2020, a 7% increase from 2019 (Invest Europe, 2021), but still significantly less than the $69.1bn raised by US investors in that same year (Thorne, 2020). This shows that there is still a significant gap in the capital committed to private investors between Europe and the US. Despite playing a crucial role in supporting innovation, VC investments only make up a small share (<0.1%) of most European countries' gross domestic product (GDP) (Statista Research Department, 2022). The 0.1% is notably less than in Israel and the USA, where the VC industry is more mature and represents more than 0.35% of GDP (OECD, 2017). However, VC investments in Europe have increased drastically over the last ten years (Silicon Canals, 2022), with the UK, DACH (Germany, Austria, Switzerland), France, and Benelux being the hotspots (Nalin, 2020). Interestingly, investments in software start-ups have made up a growing portion of VC transactions in Europe. In 2021, the broad software umbrella soared to a record transaction value, accounting for 35.2% of overall deal value in Europe with €36.3 billion invested. Cloud-based firms have been attractive investments for many years as they scale quickly across borders with few entry barriers in many countries. On top of that, cloud-based start-ups that employed, worked, and expanded remotely were also the most successful in navigating the COVID-19 pandemic. Both may explain the resilience of the transaction value of software deals in 2020 and 2021.

The first step in the VC investment process is proposal screening, also called deal sourcing (Metrick & Yasuda, 2021). This is followed by a lengthy due diligence process, resulting in the start-up receiving an offer, also called a term sheet (Metrick & Yasuda, 2021). Term sheets are preliminary contracts by which the VC expresses its interest to start more detailed negotiations (Metrick & Yasuda, 2021). It summarises the principal terms of equity financing and elaborates on the offered purchasing price per share (Metrick & Yasuda, 2021). To determine the price per share, they use various valuation methods from the corporate finance literature, such as the discounted cash flow (DCF) model, comparable analysis, reverse engineering, or the VC method. Mistakes in the fair value estimation have apparent consequences for VCs, their investors, and entrepreneurs. The VC's ROI and reputation will suffer from overvaluation as down rounds are more likely to happen. Undervaluation will result in excessive dilution of the existing shareholders, and the VC will not stay competitive for the good deals. However, unlike listed companies, the price is not driven upwards or downwards by the broader market (Caselli, 2022). Therefore, the final price per share will have to be negotiated between the VC and the existing shareholders of the business (Caselli, 2022). Finally, if both sides reach a deal, the start-up receives the money, and the financing need is satisfied (Caselli, 2022) in return for an ownership stake in the business.

This thesis discusses explicitly the practical use of comparable analysis and therefore does not elaborate on the other valuation models. But what does comparable analysis mean exactly? Comparable company analysis (or "comps") is a valuation methodology that looks at ratios of similar quoted companies or transactions/acquisitions of private companies and uses them to derive the value of a start-up (Alemany & Andreoli, 2018; Metrick & Yasuda, 2021). Ultimately, the start-up's valuation is determined by multiplying a ratio (or "multiple") based on the comparables by a metric (mostly financial) of the start-up (Metrick & Yasuda, 2021). Roughly speaking, there are five steps in this method. First of all, practitioners compose a list of comparable quoted

companies or transactions/acquisitions based on various selection criteria. Once the practitioner has composed a set of comparables, it is time to gather the information needed to calculate the multiple with which the start-up will be valued. Hereafter, practitioners calculate the multiples for each comparable by dividing the enterprise value (EV) by the metric of interest (e.g., Revenue, EBITDA, EBIT, etc.). Subsequently, these multiples are averaged and/or adjusted for outliers. Ultimately, the average adjusted multiple is used to determine the start-up's valuation.

For example, a VC is interested in investing in start-up ABC ($5M revenue, negative net income) and opts for a comparable quoted company analysis to value the business. At first, the investor searches for similar companies and finds three in total. Next, the investor decides that the sales multiple is the most appropriate considering start-up ABC's financial profile. Subsequently, the EV and sales numbers are looked up for each comparable company and the EV/Sales multiples are calculated, as shown in Table 1. Hereafter, the average sales multiple is determined for the entire set, which is 5.79x. With a revenue of $5M, start-up ABC is theoretically valued at $28.95M before investment.

Table 1 – Comparable analysis matrix of quoted comparable companies (example)

	Enterprise Value (EV)	Sales	EV/Sales
Company A	$5.3B	$706.5M	7.49x
Company B	$0.3B	$80.68M	3.27x
Company C	$1.6B	$247.3M	6.62x
Average			5.79x

Alternatively, the VC can also opt for comparable transaction analysis. Like quoted comparable company analysis, the investor looks for comparable private businesses that were recently acquired are raised funding. In most cases, transaction values are published in newspapers, dedicated financial market websites, and dedicated VC and M&A databases. Hereafter, the average multiple is determined for the entire set, as shown in Table 2. Based on this approach, start-up ABC would theoretically be worth €30.15M.

Table 2 – Comparable analysis matrix of comparable transactions (example)

	Transaction Value (TV)	Buyers	TV/Sales
Company D	$5.3B	Average ltd.	5.31x
Company E	$0.3B	Other Group	8.01x
Company F	$1.6B	Junior Enterprises	4.76x
Average			6.03x

The multiple derived from the set of comparables (5.79x or 6.03x in the examples) is not necessarily the same as the multiple used in the deal. Specific characteristics and past performance of the business might incline VCs to offer a higher or lower multiple. Therefore, I will refer to the multiple derived from the set of comparables as the "theoretical multiple". It merely serves as a starting point in the valuation process and gives the investor a rough idea of what multiple to offer. However, it is crucial to understand that it is subject to various adjustments before arriving at the multiple used to value deals. This will be discussed later on in this thesis.

3 Literature review

This chapter reviews the existing literature on comparable analysis and factors. First, section 3.1 presents theory of comparable analysis and the current state of the literature on the practical use of this valuation model. Section 3.2 summarises and reviews the findings of academics on factors that influence start-up valuations. At the end of this chapter in section 3.3, I will summarise the current knowledge gap that led to the writing of this thesis.

3.1 Comparable analysis

VCs rely upon various valuation methodologies to determine fair value estimates. Most research has focused on the practical application of the well-known DCF technique. However, surveys among VCs show that comparable analysis is also a prevalent valuation methodology (Dittmann et al., 2004; Karsai, Wright, Dudzinski, & Morovic, 1998; Manigart et al., 2000; Paliard et al., 2001; Van Laere, 2020) in countries with developed stock markets and English-based legal systems (Reverte et al., 2016). This is because, in countries with developed stock markets, there are a greater number of comparable companies to include in the analysis (Reverte et al., 2016). Regardless, comparable analysis has also gained popularity in the smaller European markets such as the Eastern, Central, and Southern European regions (Karsai et al., 1998; Reverte et al., 2016; Van Laere, 2020).

One of the crucial steps in comparable company analysis is the selection of comparable private or public businesses to determine the "theoretical multiple", which is the average or median multiple derived from a set of comparables. Most academics recommend to select comparables with financial criteria. For example, Metrick and Yasuda (2021) advise VCs to choose companies with similar long-run margins and productivity. Cooper and Cordeiro (2008) also recommend selecting businesses with similar growth rates. Furthermore, Bhojraj, Lee, and Ng (2003) add cost-of-capital to the list, and Dittmann and Weiner (2005) propose return on assets (ROA) as another criterion. Nonetheless, the applicability of financial criteria for start-up valuation is questionable.

To arrive at a set of comparable transactions, VCs must first select comparable private companies. But these companies do not have to publicly disclose their financials. Therefore, it is almost impossible to compose a set of private businesses based on similar long-run margins, productivity, growth rates, and cost-of-capital (Alemany & Andreoli, 2018). Regardless, Paliard et al. (2001) and Van Laere (2020) show that VCs still regularly use comparable transaction analysis to determine fair value estimates. Consequently, the question arises of where VCs find the financial information on private companies. Luckily, there is no such information asymmetry for quoted companies. However, finding quoted companies with similar growth rates is undoubtedly challenging because start-ups usually grow at higher rates than quoted companies. Moreover, I believe that finding quoted comparables with a similar cost-of-capital is also tricky. This is because start-ups mostly rely on equity financing in subsequent funding rounds. The different equity claims make it challenging to determine a start-up's cost of equity (Damodaran, 2009) and, therefore, the cost-of-capital cannot be calculated either. Lastly, Caselli (2022) and Damodaran (2018) show that start-ups are seldom profitable in the early stages of development, so selection based on ROA (a metric that indicates a company's profitability in relation to its total assets) makes little sense.

Apart from financial criteria, various non-financial criteria are mentioned in the literature such as sector, industry, and geography. For example, Dittmann and Weiner (2005) state that comparables

should be selected from the same country for maximum accuracy when the to-be-valued business operates in the USA, UK, Denmark, and Greece. For the other European countries, they advise selecting comparables from all the other European Union member states (Dittmann & Weiner, 2005). I question whether VCs have the luxury of being selective on geography because it is tricky to find comparables due to the start-up's unique innovative and growth characteristics in general (Audretsch & Link, 2012), let alone in the same country. Selection based on sector or industry seems perfectly possible. However, no paper has explored whether VCs actually use these selection criteria.

Furthermore, Cooper and Cordeiro (2008) have investigated how the accuracy of the comparable company valuation in public markets changes with the number of comparable firms selected. Cooper and Cordeiro (2008) discover that utilizing ten comparable firms to determine the theoretical multiple is as accurate as using all the companies within the industry. However, they find that using less than ten companies is less accurate. VCs often struggle to find comparables because of the start-up's unique innovative and growth characteristics (Van Laere, 2020). As a result, I question whether VCs can find ten comparable companies at all and maybe use industry average multiples instead to overcome this issue.

After composing the set of comparables, practitioners calculate the theoretical multiple. However, there are contradictions in the literature about which type of multiple is most prevalent in VC. Karsai, Wright, and Filatotchev (1997) report that the price to earnings (P/E) and earnings before interests and taxes (EBIT) multiples are ranked third and fourth among the most frequently used valuation techniques in Hungary, Poland, and Slovakia. Similarly, Manigart et al. (2000) find that the EBIT and the P/E multiple are the most popular multiples in the USA and the UK. However, more recent research by Van Laere (2020) demonstrates that the ARR and sales multiple are the most common in Belgium. Counterintuitively, the use of P/E and EBIT multiples in VC is quite remarkable because start-ups are rarely profitable (Caselli, 2022; Damodaran, 2018). The discrepancy between Van Laere (2020), Karsai et al. (1997) and Manigart et al. (2000) could be explained by a difference in taxonomy. Karsai et al. (1997) and Manigart et al. (2000) have adopted a broad definition of VC, also encompassing growth and private equity (PE) funds. Specific research on PE firms shows that these investors almost always use EBIT or earnings before interest, taxes, depreciation, and amortisation (EBITDA) multiples (Mukhlynina & Nyborg, 2016). So, a high concentration of PE firms in their samples might explain why P/E and EBIT multiples have high-frequency scores. For enterprises that yet have to establish operations and not yet obtained sustainable profitability, I expect a revenue multiple to be more appropriate to determine the fair value of start-ups. It is, of course, essential that entrepreneurs know what type of multiple their business is valued with. This led to the formulation of the first hypothesis (H1).

H1	Revenue multiples are significantly more used than other types of multiples to value start-ups.

Lastly, the International Private Equity and Venture Capital (2018) valuation guidelines emphasise the importance of adjusting the theoretical multiple because of notable differences between start-ups and comparable companies. For example, VCs should consider the difference in liquidity between the start-up's shares and quoted comparable companies trading on stock markets (IPEV, 2018). Van Laere (2020) finds that some Belgian VCs apply standardised adjustments on the multiple based on comparable quoted companies. However, illiquidity is only one of the recommended aspects to adjust the theoretical multiple for (IPEV, 2018). Another point for adjustment might be the difference in size between start-ups and mature enterprises or a start-

ups excessive reliance on several key customers or employees. Unfortunately, no paper has explored whether VCs also apply standardised discounts for other aspects than liquidity differences. Surprisingly, the IPEV (2018) guidelines do not recommend adjusting multiples based on comparable transactions for premiums paid in M&A deals. It is fairly common in an acquisition to offer a higher valuation than the estimated fair value of the business. These multiples might give the investor a wrong impression of the market-wide valuations.

3.2 Valuation-influencing factors

In the valuation process there are several factors that influence the valuation decision of investors. These factors can either be traced back to the characteristics of the investor or the start-up. In section 3.2.1, the valuation influencing start-up characteristics are discussed. Hereafter, I elaborate on the VC characteristics are discussed in section 3.2.2.

3.2.1 Start-up characteristics

According to Hand (2005), accounting information and financial statements are undoubtedly value-relevant but not in series A rounds. However, Manigart, Wright, Robbie, Desbrieres, and De Waele (1997) argue that income statement and balance sheet items provide enough information for the VC to evaluate the future financial performance of start-ups. These papers conflict because if the realised financial information is a good foundation for future performance prediction, it will ultimately affect the VC's valuation decision, even in seed and Series A rounds. On top of that, the company's financials also serve as inputs for different valuation models. Various academics confirm that VCs make use of these models to perform fair value estimations (Dittmann et al., 2004; Manigart et al., 2000; Pintado et al., 2007; Reverte et al., 2016; Wright et al., 2004), even in seed and Series A rounds (Van Laere, 2020). Therefore, the statement of Hand (2005) is questionable. However, Hand (2005) and Smith and Cordina (2014) show that the value relevancy of financial factors increases along the growth stages. Similarly, Wright and Robbie (1996) document that late-stage VC investors in the UK place a greater emphasis on financial data. This is in line with the arguments of Feld and Mendelson (2019).

More specifically, Hand (2005) finds that research and development expenses, cash-on-hand, and non-cash assets increase pre-money valuations and that debt and stock option dilution have a negative impact. Interestingly, Armstrong, Davila, and Foster (2006) show that, on the one hand, higher revenues result in higher valuations but also expenses. They argue that VCs interpret these costs as investments to generate more cash flows in the future. The positive association with costs seems counterintuitive, especially because Sievers, Mokwa, and Keienburg (2013) refute this argument by saying that expenses, such as the cost of sales and administrative fees, negatively influence the valuation. There is an apparent discrepancy in the value relevance of cost-related factors, which caused me to believe that some practitioners attach greater value to profitability and others to future growth prospects. Armstrong et al. (2006) based their analysis on data collected between 1993 and 2003 amid the dot-com bubble. A period in which VC funds managed a record number of capital (National Venture Association, 2021) and invested in just about every software start-up they came across. Therefore, I doubt whether the findings of Armstrong et al. (2006) can be generalised to other periods. This caused me to believe that profitability is more valuable than growth prospects in regular times. However, the current valuations of software as a service (SaaS) companies remind some investors of the dot-com period (Belcher, 2021), so there is a good possibility that costs are again positively correlated with valuations in the current economic environment.

Apart from financial information, the start-up's intellectual property (IP) is also deemed value relevant by academics. For example, David H Hsu and Ziedonis (2013) demonstrate that patents are more relevant in early financing rounds. In the same study, David H Hsu and Ziedonis (2013) find that patents' value relevancy is inversely related to the founder's experience. In other words, the effect of patents on valuation increases when the founder has no prior experience in taking a company public. Similarly, Greenberg (2013) documents that patent applications positively influence venture valuations for companies operating in life science, communications, and semiconductor industries. However, they determine that patents are not value-relevant for software start-ups (Greenberg, 2013).

Regardless, I expect the broad concept of technology (not only IP) to be one of the primary value drivers in the seed stage. This is primarily because seed-stage start-ups focus on the technological development of the product, not on driving sales or capturing market share (Caselli, 2022). Consequently, these start-ups only have little proof of operational and financial performance (Damodaran, 2009). As a result, I expect product/technology-related factors to be more important in the valuation decision than momentum (traction of the business and financial information) in the seed-stage. This led to the formulation of the second hypothesis (H2). This hypothesis is relevant for entrepreneurs who are raising money from VCs for the first time. Many doubt whether they should rather emphasise the progression of their technology or the first business traction when negotiating valuations with seed investors. This hypothesis will dispel these doubts.

H2	Technology is significantly more value relevant than momentum when determining the multiple used for seed-stage start-ups.

Once the start-up starts testing its product or service in the market past the seed-stage, technology will likely become an enabling factor for momentum, especially in the software space where various founders implement product-led growth as a go-to-market strategy. Therefore, similar to the findings of Wright and Robbie (1996), I expect the focus to shift from the start-up's technology to financial information and business traction in the valuation process of early-stage businesses. This led to the formulation of the third hypothesis (H3).

H3	Momentum is significantly more value relevant than technology when determining the multiple used for early-stage start-ups.

Furthermore, several founder and team characteristics also give VC guidance to the start-up's quality and valuation (MacMillan, Siegel, & Narasimha, 1985). For example, Feld and Mendelson (2019) argue that the valuation range is determined by the founding team's experience in the early stages of development. More specifically, David H. Hsu (2007) demonstrates that founders with a successful exit track record increase their chances of raising capital from VCs at a higher valuation. This is in line with the results of Wasserman (2017). Gompers, Kovner, Lerner, and Scharfstein (2010) refute this finding as they show that serial entrepreneurs do not receive higher valuations from VCs for their new start-ups. There is a discrepancy between the paper of Gompers et al. (2010) and the other academics, which may be attributed to the data coming from different time periods. Gompers et al. (2010) rely on data collected between 1980 and 2000 from a market that looks quite different from today. The importance of management might have increased after the burst of the dot-com bubble as investors might have opted for more holistic due diligence

procedures. The ability of founders to engage their personal network is also deemed valuation relevant (David H. Hsu, 2007; Wasserman, 2017). For example, David H. Hsu (2007) states that entrepreneurs who recruit executives through their personal network tend to be offered higher venture valuations. On top of that, the total number of founders, the completeness of the management team, professional experience in the start-up's operating industry, and the founder's education are proven to be value relevant as well (David H. Hsu, 2007; Miloud, Aspelund, & Cabrol, 2012; Sievers et al., 2013; Wasserman, 2017).

Despite no papers covering the relative importance of management in valuation yet, it is proven to be an important, if not the most important, factor in deal selection. For example, MacMillan et al. (1985) demonstrate that whether or not VCs invest is ultimately determined by the quality of the entrepreneur. In line with MacMillan et al. (1985), Reverte et al. (2016) find that the competence and expertise of the management team is the most important factor for a sample of British, Italian, French, and German VCs. The importance of the management team in deal selection is also demonstrated by Gompers, Gornall, Kaplan, and Strebulaev (2020), Sander and Kõomägi (2007), and Payne, Davis, Moore, and Bell (2009). Because of its importance in the deal selection, it is logical to assume that the start-up's management will have an apparent influence on valuation. Therefore, I hypothesise that the management will be the most important factor in determining the valuation multiple offered, as formulated in hypothesis 4 (H4).

H4	Management is significantly more important than momentum, market, technology, and money related factors when determining the valuation multiple used.

Lastly, there are other factors not related to the start-up's technology, financials or management team that are also mentioned to be value relevant. For example, Bussgang (2010) finds that the start-up's funding need to achieve the next milestone, and the VC's predetermined target equity stake in the business also influence pre-money valuation. This is rather applicable to early-stage VCs, which tend to base their valuation on the percentage of the start-up's ownership stake they want to possess (Gompers et al., 2020; Van Laere, 2020). Moreover, Gompers et al. (2020) find that exit considerations are also crucial in valuation, according to 86% of VCs participating in their research. The VC business is widely known for its extreme volatility, with much of this volatility linked to changing valuations and activity in public equity markets (Gompers, Kovner, Lerner, & Scharfstein, 2008). To put this into context, VCs liquidate their investments through an initial public offering (IPO), acquisition, or secondary sale whereby the exit valuation depends heavily on public market multiples. If a big exit at a high valuation is compromised due to unfavourable public market conditions, VCs adjust the price per share downwards for new investments to maximise their chances of achieving the fund's target internal rate of return.

Alongside the factors that directly influence start-up valuations, academics have also studied the VC investment selection procedure and the factors that play a role here. Despite several of these factors' risks being mentioned in investments theses, it is still unclear whether these influence valuations as well. Usually, higher perceived risk results in VCs demanding a higher required rate of return resulting in a lower valuation offered (Gompers et al., 2020; Manigart et al., 1997; Pintado et al., 2007). So, I would expect that any factor with an associated risk is, by definition, value relevant if it is not a deal-breaker. One of these factors is customer adoption (Gompers et al., 2020). Kaplan and Strömberg (2004) find that the risk and uncertainty regarding customer adoption are addressed in 22.4% of the investment theses reviewed in their study. Considering the relation between risk and valuation, one would expect that such identified risks affect the start-ups' valuation. However, customer adoption has not been mentioned as a valuation-

influencing factor in the literature yet. Besides customer adoption, market risks (incl. market size and growth opportunities) and product/technology risks (e.g. unique selling point (USP), scalability, defensibility, etc.) are also frequently mentioned in investment theses (Kaplan & Strömberg, 2004). Also, these are not yet confirmed as value-relevant to my knowledge.

3.2.2 VC characteristics

Besides factors related to the start-up itself, academics have also researched the influence of VC characteristics on pre-money valuation. VC reputation and experience are two factors mentioned interchangeably in the literature. According to some academics, founders who receive multiple term sheets prefer lower valuation offers from more reputable VCs (Bengtsson & Sensoy, 2011) because they expect superior value-adding services (D. Hsu, 2004). This explains why Israelian founders emphasise more on valuation in the negotiation with lesser reputable VCs. Interestingly, Gompers et al. (2010) refute the bargaining theory as they demonstrate that experienced VCs pay higher valuations instead of lower valuations. This could be because more experienced VCs invest in higher-quality start-ups (Sørensen, 2007) and therefore have to reach deeper into their pockets. Similarly, Cumming and Dai (2011) demonstrate that firms with higher future performance potential are more likely to switch to VCs with a better reputation.

The original bargaining theory may apply when the competition between VCs is at normal levels. However, European fund inflows have increased rapidly (Invest Europe, 2021), whereby the number of active VC firms in Europe has quadrupled in the last ten years (Norrestad, 2018). The increase in fund inflows has ultimately resulted in higher valuations due to increased rivalry and competition among VCs (Gompers et al., 2020; Van Laere, 2020). Therefore, I believe that the original bargaining theory may not apply in the current economic environment. Instead, I expect entrepreneurs to have the ultimate bargaining power as they can inflate valuations by having VCs bidding against each other. In this context, I hypothesise that more experienced VCs pay higher multiples as they usually invest in higher quality start-ups, of which valuations are inflated due to the entrepreneurs' prevailing bargaining power (H5). Moreover, I expect that more experienced VCs pay higher premiums for businesses with exceptional momentum (H6) and management (H7) because they invest more frequently in high-quality businesses with an exceptional momentum and management team.

H5	More experienced VCs pay higher multiples for software start-ups.
H6	More experienced VCs pay higher premiums for software start-ups with exceptional momentum.
H7	More experienced VCs pay higher premiums for software start-ups with exceptional management.

3.3 Knowledge gap

Valuing start-ups remains a challenging task to this day. Despite the relevance, VCs' approaches to the valuation of start-ups have yet to be thoroughly described in the academic literature.

Various corporate finance and venture finance textbooks describe how practitioners should apply valuation models in theory. But VCs face numerous practical challenges originating from the start-up's unique characteristics and the financial information asymmetry in private markets which could compromise the applicability of valuation techniques in the VC context. Regardless, Manigart et al. (2000), Karsai et al. (1997), Dittmann et al. (2004), Karsai et al. (1998), Pintado et al. (2007), Van Laere (2020), and Reverte et al. (2016) report that comparable analysis is a frequently used model in practice. However, no paper discusses how VCs use comparable analysis in practice and how they deal with the challenges of valuing very early-stage businesses. In other words, it is still unclear how software investors arrive at the multiple they eventually offer in deal negotiations. This knowledge gap has led to the writing of this master thesis and the formulation of the main research question.

Despite academics listing various criteria that practitioners could apply in the selection procedure of comparable businesses or transactions, I am convinced that the existing literature is incomplete and fraught with problems. Most research is focused on the selection with financial criteria, which are challenging to apply due to significant differences in growth rates, gross-margins, and profitability between early-stage businesses and quoted companies. Furthermore, financial criteria are also not suited to select private business as they do not publicly disclose financial information. Therefore, I expect VCs to make selections based on company characteristics rather than financials. Unfortunately, these business-related criteria are still shrouded in mystery. Understanding the selection procedure is especially relevant for entrepreneurs who want to estimate the fair value of their business as accurately as possible prior to negotiations with VCs. Entrepreneurs will learn how VCs select comparables from which they derive the multiple that they use as a starting point in their valuation process.

Besides, various academics show that start-up characteristics influence VC valuation behaviour. However, I believe that the literature has overlooked some factors. Despite market, customer adoption, and technology/product risks being frequently mentioned in investment theses (Kaplan & Strömberg, 2004), with risks usually exerting negative pressure on valuation, the literature has not talked about the value relevance of these factors. Additionally, a few papers have explored the relative valuation relevance of the factors, but they do not provide the complete picture. For example, Sievers et al. (2013) compared the value relevance of financial data with team characteristics but left out the other factors. As far as I know, no study compares all valuation-influencing factors mentioned in the literature. This is particularly interesting for entrepreneurs as they do not know yet what aspects of the business matter the most in the valuation decision of VCs. This is, of course, important information because it greatly benefits entrepreneurs. If they know which factors are most important, they can then emphasise them in their next funding rounds to enforce more favourable valuations.

Lastly, there is an ongoing debate in the literature on the influence of VC firm experience on valuation. Some academics (Falik, Lahti, & Keinonen, 2016; Heughebaert & Manigart, 2010; D. Hsu, 2004) agree with the bargaining theory, which says that more reputable VCs have the bargaining power to offer lower valuations because they bring more value to the table (Welpe, Dowling, & Picot, 2010). This may be true when the competition between VCs is at normal levels. However, a lot of capital is currently chasing a few quality investments resulting in increased competition and rivalry between VCs. As a result, the VC bargaining theory may no longer be valid in the current economic environment. Therefore, it is particularly relevant to research the relation between valuations, valuation behaviour, and VC firm experience to check if theories still apply in other economic environments.

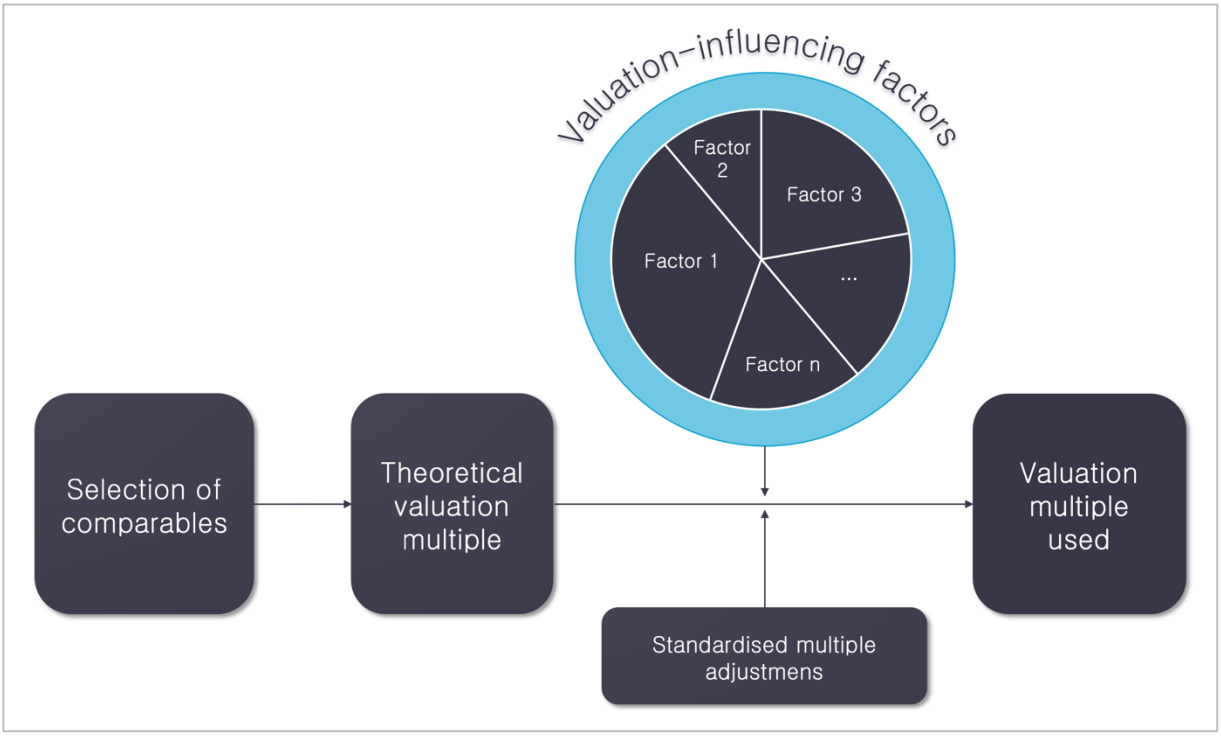
4 Research Methodology

In this thesis, I applied a mixed methods approach with an embedded research design. In section 4.1, I explain why I opted for a mixed methods approach. Subsequently, section 4.2 elaborates on the embedded research design of interviews in combination with highly structured questionnaire containing both open and closed-end questions. After that, the data analysis of both the quantitative and qualitative data is discussed in section 4.3.

4.1 Research Strategies

This research aims to better understand how software VCs arrive at the multiple used in valuation negotiations. Based on the literature and initial conversations with practitioners, I developed a conceptual framework that visualises the process behind the determination of the multiple, shown in Figure 1. VCs must first select comparable companies to derive the theoretical multiple as described in theory. As demonstrated in chapter 3, the selection procedure is a relatively little-discussed topic in the literature, with most academics elaborating on financial criteria. Because of the challenges associated with selection based on financial criteria in start-up valuation, I expect VCs to use other criteria instead. However, these criteria have yet to be identified and described. Therefore, the context of the answers is crucial to get a holistic picture of the VCs' reasoning behind using specific criteria. As a result, a qualitative research strategy is most applicable to explore this part of the comparable analysis process.

Figure 1 – Conceptual framework of comparable analysis in practice



Notes: this figure visualises how the valuation multiple paid for an investment comes about. The valuation influencing factors will not all be equally important. The factor's relative weight scores are visualized by the unequal pie slices.

However, this study also aims to examine the relative importance of factors in determining the multiple and the changes in VC valuation behaviour according to the favourability of these factors. As already mentioned in chapter 2, the theoretical multiple is influenced by factors and

standardised multiple adjustments. To put this into perspective, I will expand on the example from chapter 2. In the due diligence process of start-up ABC, a VC will analyse and assess various factors related to the company. This assessment of factors will ultimately influence the VC's perceived value of different aspects of the business. Of course, some factors will be more value relevant than others. So, each factor theoretically has a relative weight score in the investor's mind. Therefore, they are displayed in a pie chart in Figure 1. Subsequently, due the perceived favourability of ABC's factors, VC will be inclined to deviate from the average or median multiple derived from the set of comparables. For example, suppose ABC shows extraordinary revenue growth compared to its comparables. In that case, VCs will be inclined to offer a premium on the theoretical multiple to secure a deal. But a negative correction of the theoretical multiple might also happen if the VC perceives a specific factor as unfavourable. I will refer to these deviations as a result of the factor's favourability as valuation behaviour. Because I want to quantify these deviations and explore if VC firm experience is an explanatory factor for this behaviour, I will need a quantitative research strategy.

By relying on either quantitative or qualitative data alone, the whole process behind the determination of the multiple offered cannot be studied and mapped out properly. Therefore, I decided to opt for a mixed-methods approach whereby quantitative and qualitative data are collected and analysed simultaneously. This had several advantages. On the one hand, mixing methods allowed me to put findings in context and strengthen the statistical tests' results with quotes from the interviews. On the other hand, using different ways to collect data has made the results more credible and strengthened the validity of the conclusions.

4.2 Research Design

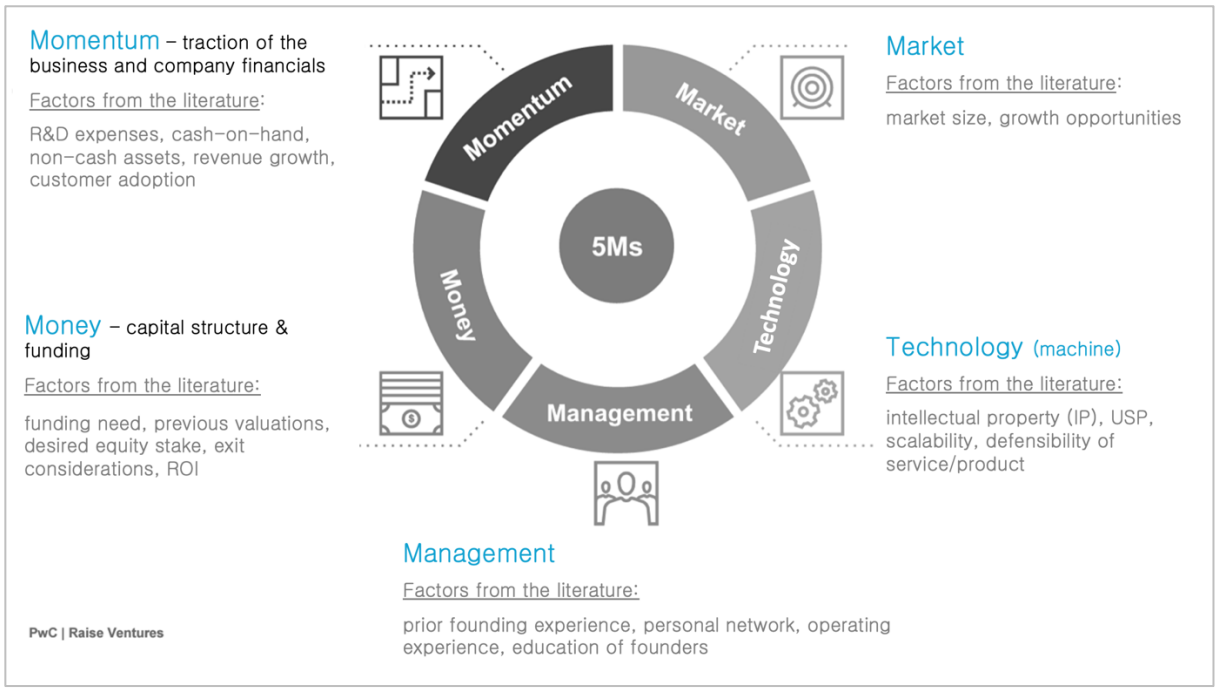
To operationalise the mixed methods approach, I opted for an embedded research design of online interviews combined with a highly structured questionnaire containing open-ended and close-ended questions. As a result, all questions were answered verbally, including the close-ended questions with which quantitative data was collected. This allowed me to sporadically ask respondents to elaborate on their answers to the close-ended questions, ensuring I captured the respondents' thought processes behind their answers. If the close-ended question had predefined list of potential answers, they were shared with the respondent through the screen sharing option of the video conferencing software, primarily Microsoft Teams and Zoom. As a result, the answers were not ticked by me but by the interviewee increasing the validity and reliability of the data collected. All interviews were held from December 2021 up to January 2022. More information on the interview procedure can be found in Appendix 2.

4.2.1 Questionnaire

Ultimately, the empirical basis of this study is the completed questionnaires of 36 European software VCs. This questionnaire was developed in two stages. Firstly, a first version questionnaire was drafted based on the literature and initial conversations with practitioners. This questionnaire was subsequently evaluated in a pilot study with one industry expert and two VCs. In these pilot interviews, I asked the participants to quantify the relative importance of all factors mentioned in the literature. Here, I learned that the list of factors in the draft questionnaire was too specific for interviewees to provide accurate answers. During the pilot interviews, the interviewees repeatedly referred to broader categories, such as the quality of the management team, the technology, and traction, which they include in the valuation decision. As a result, the initial list of factors was regrouped into five broader categories based on PwC's 5M framework, comprising momentum, market, technology, management, and money, as shown in Figure 2.

Furthermore, during the pilot interviews, I checked if the draft questionnaire complied with the main guidelines for questionnaire development outlined by Sekaran and Bougie (2019). Firstly, I assessed if the questionnaire adhered to the principles of wording. This is a two-fold concept meaning that (1) all language and wording used in the questionnaire is understandable to the interviewee to minimise bias, and (2) each question's objective is carefully considered to ensure that the variables are adequately measured while no unnecessary questions are asked (Sekaran & Bougie, 2019). Some questions from the draft questionnaire were redundant, and these were taken out. Furthermore, I reformulated several other questions for clarity. Secondly, I made sure that the questionnaire also complied with the principles of measurement to guarantee that the data collected was appropriate for testing the hypotheses of this thesis (Sekaran & Bougie, 2019). These pertain to the scales and scaling methodologies used to measure concepts and evaluate the measures' reliability and validity (Sekaran & Bougie, 2019). Regarding the principle of measurement, the pilot interviewees did not have any comments, and the scales and scaling methodologies remained untouched.

Figure 2 – 5M model by PwC Raise Ventures (Waters, 2021)



In total, the questionnaire comprises 11 sections. A full copy of the questionnaire can be found in Appendix 11. The first three sections relate to the respondent's personal information, firm characteristics, and fund characteristics. In section four, the frequency of use of various valuation methods is surveyed using a Likert-scale (0 = never, 4 = always). Only the VCs that use comparable analysis seldom or more were asked to complete the following questionnaire sections. These sections and the accompanying questions were designed to reflect the different steps of the comparable analysis methodology described by Metrick and Yasuda (2021) and the IPEV (2018) guidelines. Sections five and six therefore related to the selection process of comparables and the information sources used. In section seven, I ask questions about the frequency of use of various valuation multiple types. For this, the same Likert-scale was used as in section five. Sections 8, 9, 10, and 11 relate to different investment stages. The definitions of the different investment stages are not unambiguous. For this reason, the categories were defined based on ARR. ARR is an important metric in software which represents the annually revenue from current subscribers. In this study, I differentiate between four investment stages: 0 ARR (pre-seed), 0-

1M ARR (seed), 1–5M ARR (early-stage), and +5M ARR (late-stage). Consequently, section 8 relates to the 0 ARR investment stage, section 9 to 0–1M ARR, section 10 to 1–5M ARR, and section 11 to +5M ARR. It is crucial to note that respondents were asked only to complete the questionnaire sections corresponding to the stages in which they actively use comparable analysis as a valuation method.

In these sections, I explore the relative weight scores of factors, ARR multiples paid, and VC valuation behaviour due to the perceived favourability of factors. To determine the relative weight score of momentum, market, technology, management, and money, I asked the interviewee to divide a pool of 100 points over all factors according to their importance. More advanced multi-criteria decision-making methodologies, such as the best-worst method by Rezaei (2015), were considered, but pilot study interviewees deemed these approaches too complex. Subsequently, I asked the interviewees about the minimum, average, and maximum ARR multiples they have paid for recent investments with the latest fund. Lastly, VC valuation behaviour was mapped by asking how many per cent (%) they would deviate from the theoretical multiple if they would perceive a factor as significantly below average, below average, above average, and significantly above average.

4.2.2 Selection of Participants

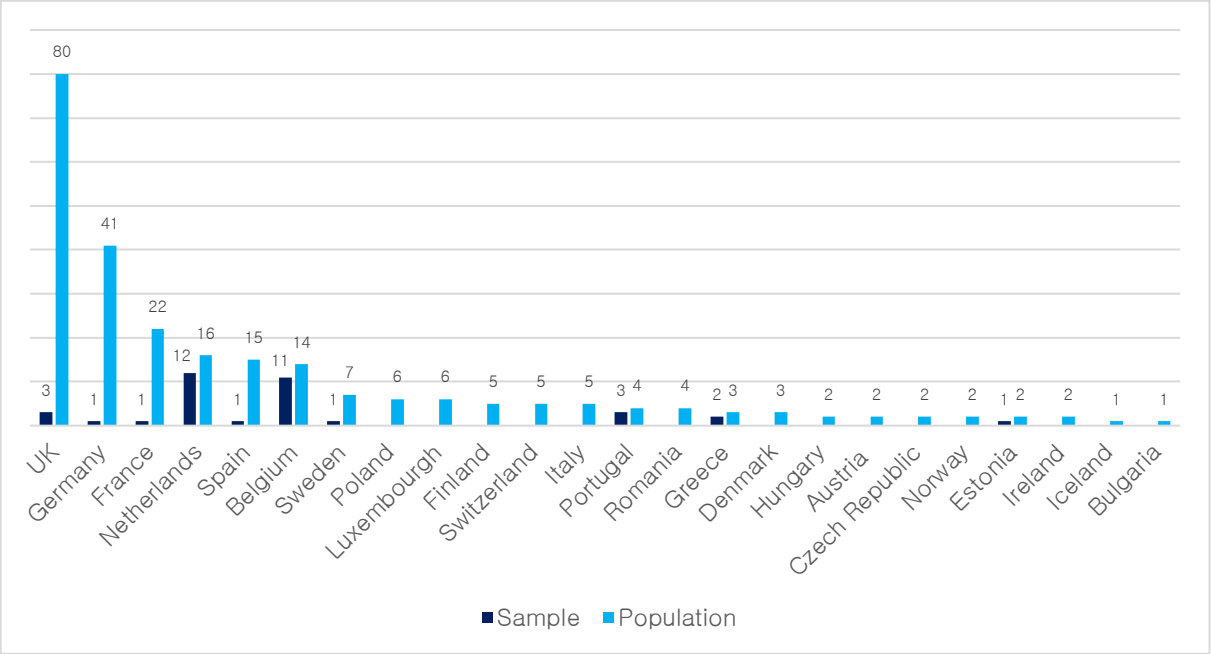
The estimated population of software VCs in Europe is 250 based on the Dealroom.co database. How I came to this conclusion is outlined in Appendix 3. No specific sampling approach was used because the population is relatively small. Partners and investment managers from all VC firms within the estimated population were sent an invitation via e-mail to participate in the research. Venture Partners were not contacted because they are not necessarily employed by the VC firm and rather act as advisors for the investment team and engage with portfolio companies on a case by case basis (Gompers et al., 2020). People with junior status, such as associates and analysts, are also not directly approached. They are usually responsible for deal sourcing and due diligence of future investments. Consequently, they often lack experience in deal negotiation and valuation decision-making. However, when the GP showed a willingness to participate in an interview but was unavailable between December 2021 and January 2022, junior people from the firm were invited to join on their behalf.

In total, 45 firms showed a willingness to participate in the research resulting in a response rate of 18%. This is lower than similar studies by Dittmann et al. (2004), Karsai et al. (1998), and Gompers et al. (2020). Unfortunately, three VC firms did not respond to the meeting invitation even after agreeing to participate. Four others declined to participate after exchanging emails because they did not use comparable analysis in the valuation process. This leaves 38 VC firms that participated in the research. Two VCs admitted that they never considered comparables as an approach to valuation during the interview. These interviews were cut short, and I did not include their answers in the sample. In total, 36 questionnaires were successfully completed.

The final sample of participants included 16 partners, 11 investment managers, 7 associates, and 1 analyst. An anonymous overview of all participants is shown in Appendix 1. To check whether the final sample represents the population of European software VCs, I compared it to the estimated population distribution based on the Dealroom.co data. Looking at the headquarter location, the sample is relatively heavy on Belgian and Dutch VC firms, as shown in Figure 3. Out of the 36 participating firms, one third have their headquarters in The Netherlands, and 11 are based in Belgium. Unfortunately, I only managed to interview a small portion of the UK software VCs. The same holds for Germany and France. For each of these countries, only one VC firm

participated in this study. However, a strong attempt was made to include additional respondents from the UK, Germany, and France, but no one was found willing to participate. As a result, the generalisability of the results to the European context may be compromised.

Figure 3 – Population and sample distribution



4.3 Data Analysis

The data analysis was carried out after the completion of all interviews. First, the answers to the open-ended questions on comparable company/transaction selection were qualitatively analysed through coding and content analysis. More specifically, I used a provisional coding approach. This type of coding relies on a pre-set list of codes (Saldaña, 2021) based on the literature and my prior knowledge and experience and comprised the following:

- Industry
- Sector
- Investment opportunity
- Cost-of-capital
- Stage of development
- Long-run margins
- Productivity
- Growth rates
- Geography
- Business model

Similarly, I developed an initial pre-set list of codes for the information sources used for comparable companies and transactions. Unfortunately, no papers have discussed these sources yet. Therefore, the provisional codes are derived from conversations with VCs before the study and the pilot interviews.

- Dealroom.co
- Crunchbase
- PitchBook
- Newspapers
- Online news outlets
- Indices
- Investment banks
- Internal databases

These predefined codes were changed and refined as new codes and categories emerged inductively during the analysis process. I performed all coding work manually in Microsoft Excel. The first column contained the interviewee's response to the question. The codes from the first analysis were written down in the second column. Afterwards, overlapping preliminary codes were

consolidated into final codes and recorded in the third column. After that, the final codes were categorised and displayed in a matrix with the number of times a code is mentioned and the frequency of observations. These statistical findings are supported by a content analysis of the interview transcripts.

The quantitative data collected from the close-ended questions were structured in an excel file. Descriptive statistics were prepared, and more complex statistical tests were carried out using the JAPS software. The ARR multiples paid, the relative weight scores of factors and the deviations from the theoretical multiple were collected for each stage in which the VC actively uses comparable analysis to value start-ups. The stages 1-5M ARR and +5M ARR were consolidated into one broader category, defined as +1M ARR. Eight VCs in the sample invested in the 1-5M ARR and +5M ARR stages. Consequently, I averaged the answers for both stages to arrive at a single response for +1M ARR. For VC firm level analysis, I averaged the answers of each stage to arrive at the VC firm response.

Differences between VCs were tested with a t-test for significance. Only sub-samples with ten responses or more were tested to guarantee the reliability of the t-test's results. Furthermore, I applied a linear regression model to study the potential moderating effect of VC firm experience on the ARR multiples paid and the deviations from the theoretical multiple. As proposed by Köhn (2018), I used age (years), the number of funds, and fund size as proxies for VC firm experience. One of the key assumptions of linear regression is that the data of dependent and independent variables are normally distributed. However, this was not the case for fund size and the deviations from the theoretical multiple. Therefore, I performed a logarithmic transformation of the data to adjust for the outliers that skewed the normal distribution. Additionally, to mitigate the multicollinearity effect in the linear regression, independent variables with strong correlation (between −1 and −0.7 or 0.7 and 1) are not jointly used as input in the regression model.

I used four dummy variables in the linear regression model. The first variable relates to the type of VC firm, differentiating between generalist and specialist VCs. I also distinguish between international firms with offices in different countries and local firms with only one office location. The third dummy variable relates to the type of investments made, distinguishing between firms that invest in capital intensive deeptech businesses and the firms that do not. The last division is made based on the presence of institutional investors among their LP base. In this study, fund of funds, commercial banks, insurance companies, pension funds, and corporate strategic investors are considered institutional investors. So, firms with at least one of these investors amongst their LP base were categorised as VC firms with institutional LPs.

5 Results

5.1 Summary statistics

The majority of the VCs participating in this research completed all questionnaire segments. For example, all respondents elaborated on how they select comparables. Similarly, no VCs experienced any difficulty answering the question on the relative importance of factors. However, some respondents were reluctant to disclose the ARR multiples paid during the interviews. Two VCs did not disclose the multiples paid primarily due to confidentiality obligations. As a result, 34 (94%) respondents reported the ARR multiples paid for the investment stages in which they are active. The VCs in the sample were well aware of the multiples they pay for deals. They have to report their fund's performance and the multiples paid quarterly to their LPs. Unfortunately, only

28 (77%) respondents reported the deviations from the theoretical multiple for all factors. The VCs that refrained from answering this question mentioned that it was too complex for them to provide accurate answers.

Table 3 shows the number of VCs in the sample investing in a particular investment stage and the number of responses for the questionnaire segments. It becomes apparent that the VCs in the sample are fairly evenly distributed over the two investment stages. 12 (33%) VCs surveyed invest exclusively in start-ups with an ARR between zero and one million, while a quarter of VCs in the sample solely back +1M ARR businesses. 15 firms engage in both investment stages. Interestingly, the sample's distribution of seed-stage (0-1M ARR) and early-stage (+1M ARR) investors is different from the European VC population. According to the OpenVC and Dealroom.co databases, there are approximately 50% more early-stage than seed-stage software VC firms in Europe, whereas the sample is relatively heavier on seed-stage VCs. This may be due to a difference in taxonomy and categorisation.

Table 3 – Summary of statistics of responses per investment stage

	N	%
VC firms investing in stage (0 – 1M ARR)	12	33
Reported selection procedure of comparables	12	33
Reported relative importance of factors in valuation	12	33
Reported the deviations from the theoretical multiple	11	31
Reported ARR multiples paid	11	31
VC firms investing in stage (+1M ARR)	9	25
Reported selection procedure of comparables	9	25
Reported relative importance of factors in valuation	9	25
Reported the deviations from the theoretical multiple	6	17
Reported ARR multiples paid	9	25
VC firms investing in both stage	15	42
Reported selection procedure of comparables	15	42
Reported relative importance of factors in valuation	15	42
Reported the deviations from the theoretical multiple	11	31
Reported ARR multiples paid	14	39
Total responses	36	100

Notes: VCs were only asked to report the relative importance of the factors, the deviations, and the ARR multiples paid for the investment stages in which they actively use comparable analysis as a valuation methodology.

The majority of the VCs participating in this research completed all questionnaire segments. For example, all respondents elaborated on how they select comparables. Similarly, no VCs experienced any difficulty answering the question on the relative importance of factors. However, some respondents were reluctant to disclose the ARR multiples paid during the interviews. Two VCs did not disclose the multiples paid primarily due to confidentiality obligations. As a result, 34 (94%) respondents reported the ARR multiples paid for the investment stages in which they are active. The VCs in the sample were well aware of the multiples they pay for deals. They have to report their fund's performance and the multiples paid quarterly to their LPs. Unfortunately, only

28 (77%) respondents reported the deviations from the theoretical multiple for all factors. The VCs that refrained from answering this question mentioned that it was too complex for them to provide accurate answers.

While the VC firms in the sample invest in a wide variety of businesses, the analysis shows that two focus verticals within the software space stood out. 26 (72%) VC firms specialise in what I define as fintech & insurtech and 29 (81%) in enterprise software solutions such as customer relationship management software and collaborative tools. 18 (50%) VCs from the sample invest in adtech, digital consumer lifestyle, deeptech, edtech, or cyber security start-ups. proptech and sustainable tech closely trail these focus areas with 17 (47%) VC investing in these industry verticals. VCs investing in health tech, mobility tech, blockchain, and agtech are the least represented in the sample with 15 (42%), 14 (39%), 12 (33%), and 9 (25%) firms respectively. In conclusion, 21 (58%) respondents work for generalist firms ("generalist" sub-sample) which invest in a broad range of verticals. On the contrary, 15 (42%) respondents work for firms that specifically focus on a handful of verticals ("specialist" sub-sample).

To explore whether the international character of firms matters, I asked if the VC firm had other offices besides the headquarter location. 14 (39%) respondents confirmed that they have multiple office locations ("multi-office firms" sub-sample) across Europe or outside Europe, whereas 22 (61%) did not have any other offices besides the headquarters ("single-office firms" sub-sample). Despite most firms only having a single office location, they still invest across multiple geographies. Table 4 shows that 61% of firms in the sample have a European or worldwide investment focus. 39% of the sample's VCs focus on specific geographical regions of which the Benelux is the most popular. London (UK), Berlin (DACH), Paris (France), Stockholm (Nordics), Amsterdam (Benelux), and Barcelona (Iberia) are in the top ten of Europe's leading tech hubs as measured by total capital invested (Atomico, 2022). Unsurprisingly, these regions are also focus areas of the VCs in the sample. Besides, an increasing amount of money is trying to find its way to emerging start-up ecosystems searching for better deals (Atomico, 2022). One VC in the sample specifically focusses on the emerging Baltics region.

Table 4 – Number of VCs investing in a geographical region

	WORLDWIDE	EUROPE	BENELUX	DACH	NORDICS	BALTICS	IBERIA	FRANCE	UK
N	5	17	9	2	3	1	2	1	1

Notes: Benelux = Belgium, Netherlands, Luxembourg; Dach = Germany, Austria, Switzerland; Nordics = Denmark, Sweden, Norway, Finland; Baltics = Estonia, Latvia, Lithuania; Iberia = Spain, Portugal

Table 5 shows the statistics on several firm and the fund characteristics. The means, quartiles, and standard deviations are reported for each measure. Of all the firms surveyed, 27 (75%) have a closed-ended and 9 (25%) an open-ended fund structure. Closed-ended funds are bound by fund size and end date. Consequently, no additional capital can be raised once the fundraising is completed. On top of that, LPs have to be repaid before the end date (usually after 10 to 12 years). Open-ended funds, by contrast, do not have an end date whereby capital can be raised and repaid on an ongoing basis. The average age (in years) of the VC firms included in the sample

is 13.14, while the median is 8.00, having managed 2.61 funds on average so far with a median of 2.00. I asked each VC to disclose the fund size of the latest fund with which investments are made in software companies. The average fund size in this study is slightly higher than the European average. Over the last couple of years, this average has increased from €50M in 2017 to €102M in 2021 (Atomico, 2022). However, it still trails the average $195M fund size of US VCs (Davis, 2021). The difference between the median and the average fund size can be explained because a few VCs in the sample manage enormous funds. Table 5 also shows that all participating VCs have recently raised a new fund with an average vintage year of 2018. Furthermore, the average minimum ticket size for initial investments is €1.95M, while the median of €1.0M is significantly lower. Referring to a previous argument, the sample contains a few very large funds with high minimum ticket sizes, skewing the normal distribution of the data. The same is true for maximum ticket sizes, being on average €15.99M with a median of €5M.

Most VCs in the sample have a standard portfolio construction of 20 companies. Counterintuitively, the average number of active portfolio companies is also 20, but the median is 12. This can be explained by the difference in the portfolio structure of closed-ended and open-ended funds. Due to the constraints of a pre-set fund size, firms with closed-ended funds can only invest in a limited number of start-ups because a large portion of the capital is usually reserved for follow-on rounds. In contrast, VC firms with an open-ended funds do not face these issues as they can raise new capital on the way. Theoretically, these types of funds can have as many portfolio companies as they want. As a result, the nine open-ended funds skewed the distribution of the number of active portfolio companies of the firms in the sample.

Table 5 – Statistics on sample VC firms and fund characteristics

	Mean	Pct 25	Median	Pct 75	Std Dev
Firm characteristics					
Age (years)	13.14	5.00	8.00	12.50	20.53
Total number of funds	2.61	1.00	2.00	3.25	1.89
Latest fund characteristics					
Fund number	1.83	1.00	1.50	2	1.11
Fund size (€M)	159.24	50.00	85.00	125.00	266.12
Vintage year	2018	2017	2019	2021	5.12
Minimum ticket sizes (€M)	1.95	0.25	1.00	1.00	3.40
Maximum ticket sizes (€M)	15.99	2.25	5.00	10.00	49.58
Number of active portfolio companies	20.00	6.5	12.00	21.00	26.24
Target number of portfolio companies	18.69	11	20.00	25.00	10.29

Family offices or high net worth individuals (HNWI) are the most prominent LPs in the funds of the sample's VCs. To be exact, 28 (78%) have raised capital from family offices or HNWI, and they are the largest LP in the latest fund of 39% of the firms, which is higher than the European average of 18% (Invest Europe, 2021). Half of the sample is backed by government agencies and fund-of-funds. According to Invest Europe (2021), government agencies are the largest investor in 30% of the venture funds in Europe. In my sample, it is 38%. Only 7 (19%) VC firms have corporates, pension funds, and commercial banks among their LP base. One (3%) VC has raised

capital from an insurance company. This is normal in the European ecosystem but sharply contrasts with the US where insurance companies, pension funds, and university endowments are prominent LPs. However, the relatively low commitment to venture and growth funds and the overall risk aversion of institutional LPs make it challenging to raise large tickets from them. Unsurprisingly, despite 22 (61%) firms having institutional investors among their investor base, they are only the largest LP in 17% of the cases. Interestingly, VCs are also exploring alternative ways to collect money. Two VC firms have freed themselves from the constraints of the traditional closed-ended fund structure by listing themselves on the public markets. Instead of raising funds from LPs, these investors sell shares and utilize the proceeds to invest in companies off their balance sheets.

5.2 Comparable analysis as a valuation method

The analysis shows that comparable analysis is a prevalent technique to estimate the fair value of software start-ups. As mentioned in chapter 2, the literature distinguishes two approaches within comparable analysis based on the type of comparables selected. These two approaches are multiples based on comparable quoted companies and multiples based on comparable transactions. I find that multiples based on comparable transactions (M = 2.69, SD = 1.17) are the most frequently used by the VCs in the sample. Multiples based on comparable quoted companies (M = 2.44, SD = 1.40) ranks third in popularity. Comparable analysis was already an important valuation method in the mature VC markets (US and UK) but now also seems to have gained considerable popularity in other European regions.

31% of VCs in the sample indicated always using multiples based on comparable quoted companies, while 25% often use this approach to valuation. This means that 56% of the VCs in the sample apply multiples based on comparable quoted companies at least often to determine a start-up's valuation. However, 14% use it half of the time, 19% seldom, and 11% of the VCs from the sample report never using it. The majority of the VCs that never use quoted comparable companies state that there is too big a difference between start-ups and quoted companies. For example, respondent 8 explained that *"the companies we invest in are so far removed from the quoted companies that this valuation method is completely irrelevant".* Similarly, respondents 7 and 11 mentioned that *"multiples based on quoted comparables have no value"* because *"quoted companies are usually so big that the multiples are not relevant".* For these VCs, multiples based on comparable transactions are a good alternative. 28% of the VCs within the sample have emphasized in the interview that they always use multiples based on comparable transactions in the valuation process. 39% mentioned that they use it often, 11% half of the time, and 19% seldom. Interestingly, only 3% of the VCs make never use of this model. The two comparable analysis approaches have the lowest "never" percentage score of all the methods surveyed, meaning that most VCs in the sample at least use it seldomly. On top of that, 39% of participants explicitly mentioned comparable analysis as their method of preference. More specifically, 6 VCs of the 30 that explicitly expressed their preference mentioned multiples based on comparable quoted companies and eight others referred to multiples based on comparable transactions. The respondents' answers for the other valuation methods are added to Appendix 5.

The usefulness of comparable analysis as an approach to valuation depends on the start-up's stage of development. Respondent 9 emphasised *"for more mature firms, you look at multiples for an exact guidance in valuation. […] If a company has a revenue of 300K, the valuation derived from multiples will not mean much, but if the revenue is closer to one million, you can start using it".* This is because in the earliest investment stages, *"the negotiation revolves more around the dilution of the entrepreneur and less around multiples*", respondent 14 explained. Nevertheless,

89% of VCs investing in 0-1M ARR start-ups still use comparable analysis. Respondent 28 states that *"multiples based on comparables play an important role as a sanity check, even in the early investment stages. We have encountered so many companies with similar product offerings over the past 10 years, so we check if the valuation, from a multiple perspective, is reasonable compared to the comparables we have encountered".*

5.2.1 Selection process of comparables

I find that most VCs do not select comparable companies in a structured way because *"it is tough to find comparable companies [...] and you need to get creative"*, as stated by respondent 1 and affirmed by respondent 6 and 31. As a result, the majority of VCs in the sample rely on preselected sets of comparables in VC and M&A databases. For example, respondent 13 mentions that *"PitchBook is a great help in the selection process. [...] because potential competitors are already preselected".* However, this pre-selection does not always include all comparable companies as stated by respondent 13. He therefore looks at all companies in the preselected set of competitors and the competitors of those competitors to get a comprehensive view of all similar companies. 6 (17%) respondents said to never compose sets of comparables but use industry average multiples instead.

Some VCs who do self-selection of comparable companies apply the "circle" approach. This is an approach in which the practitioner stepwise composes larger sets of peers until the practitioner thinks that the derived valuation multiple is representative. Respondent 6 explained this approach in detail: *"First, we select a circle of really close peers. Sometimes there are only two or three companies in this set. That is very little. Then we take a bigger circle with less strict criteria and add three or four more companies to the set. After that, we take another larger circle and add another 10. You can then take an average of the set and play around with the valuation multiples".*

Whether VCs select comparables in a structured or unstructured manner, practitioners still rely on a set of selection criteria. I find that 30 (83%) respondents select companies from the same sector. More specifically, 10 (28%) VCs only consider private or quoted companies operating in the same industry. However, 20 (56%) respondents in the sample are stricter in their selection and compose sets of comparables from the same industry vertical only. Industry verticals are niches within a broader industry. For example, FinTech and cybersecurity are both industry verticals within software. Respondent 7 explains that *"it is a bit short-sighted to assume that a valuation of an enterprise software start-up can be determined by selecting a basket of other enterprise software businesses. [...] we look at companies that operate in the same vertical. If we value a CRM start-up, you must select similar CRM companies".* Since VCs want to approximate the relative valuations of similar businesses as accurately as possible, it is entirely logical that they are selective. Mainly because of the notable multiples in multiples between industry vertical. For example, the cybersecurity EV/Revenue multiple was 10.7x in the first quarter of 2022, whereas the financial applications (FinTech) multiple (7.2x) was notably lower at that time (SEG, 2022).

7 (19%) VCs mentioned also to consider market-related criteria. In other words, these VCs do not only select comparables from the same sector of the economy but also aim to find companies targeting the same or a similar identifiable group of customers. 4 (11%) respondents only include companies from the same geographical region because of differences in valuations between regions as explained by respondents 9, 15, 22. Before conducting the interviews, I questioned whether VCs have the luxury of being selective on geography. Multiple respondents confirmed this presumption. For example, respondent 22 explicitly said that *"we cannot be too picky on*

geography due to the limited number of comparables available in the market". Similarly, respondent 26 mentioned that *"we do not have the luxury to be selective on geography. We tend to exclude Chinese comparables due to questionable accounting practices".* Besides geographics, 3 (8%) VC affirmed to only select comparables that are targeting the same addressable market. Interestingly, this category of criteria is mentioned significantly less than sector criteria, probably because markets are generally harder to define.

Furthermore, 26 (72%) VCs select comparable companies based on specific business characteristics. The most prominent criterion in this category is the business model, which is mentioned 50% of the time. In addition, 17 (47%) respondents look explicitly for businesses with similar product offerings. The business model and product offering can be figured out for just about any company without having to do extensive research, which would explain why these criteria are so often used. Interestingly, only 3 (8%) VCs specifically mentioned searching for companies from the same stage despite various VCs questioning comparable analysis's efficacy as a valuation methodology if the theoretical multiple is derived from quoted or more mature company. Even a less prevalent criterion is the team set-up which is only mentioned once.

Specific financial and performance criteria are used significantly less than sector and business-related characteristics. I find that only 5 (14%) VCs aim to select companies with similar performance metrics and 7 (19%) with comparable financial metrics. Of the performance metrics identified in the analysis, the lifetime value of the customer is mentioned twice (6%), while customer acquisition costs, churn rate, employee efficiency, net retention, and rule of 40 are only mentioned once (3%). Considering the financial metrics, growth rates and gross margins are the most mentioned, respectively 6 (17%) and 4 (11%) times. Gross region premium and revenue ratio (ARR/Total Revenue) are only mentioned once. It is not that these criteria are irrelevant, but they are just hard to find. Respondent 6 explains that, on the one hand, *"this information cannot be found for comparable transactions"* because private businesses do not publicly disclose their financial and performance metrics. On the other hand, the financial and performance metrics of public companies may not be comparable to those of the start-up as these two types of businesses are residing in a completely different growth phase. For example, European SaaS start-ups usually post revenue growth of 100% or more year over year in the first stages of development (Le Roy & Thomas, 2021) which is rarely witnessed for quoted companies. So strict selection based on growth rates would likely not yield many peers.

Table 6 – Number of comparables selected by VCs

	0-5	5-10	+10	It depends
Observations	7	14	5	4
Frequency	23.33%	46.67%	16.67%	13.33%

Notes: 30 out of the 36 respondents confirmed to compose sets of comparables themselves. Six others solely rely on industry average multiples. As a results, the percentages are calculated by dividing the number of observations by 30.

Most VCs affirm to always look for as many comparables as possible. However, due to the unique characteristics of the start-up and the lack of available information on comparable businesses, VCs agree that it is by no means easy to find relevant comparable companies or transactions. For example, respondent 19 explained that *"you might have a list of ten similar companies, but that does not mean that the required information for these ten companies will be publicly available".* As shown in Table 6, the majority (70%) of VCs do not select more than ten comparables. This confirms the discrepancy pointed out by Cooper and Cordeiro (2008) between practitioners who

select a small number of closely comparable firms and the literature which recommends to select at least ten comparables or use industry average multiples instead. Due to start-ups' unique characteristics, VCs struggle to find comparables as stated by respondent 1, 6, and 31 but they use comparable analysis regardless. Interestingly, some VCs claim, in line with the literature, that *"the set of comparables must contain more than 10 companies"* while others emphasise to never select more than 5 comparables. So, it becomes clear that practitioners disagree on the number of comparables that should be selected to yield an accurate theoretical multiple.

Furthermore, the number of comparable companies to be found determines for some whether they use comparable analysis or not to value a start-up. For example, respondent 33 said that if he cannot find at least ten comparables, "*it will be difficult to find a (theoretical) multiple that is meaningful".* Considering this, it would seem logical for VCs to resort to industry average multiples. However, this does not seem to be the case as only 6 (17%) of the sample's VCs actively use them in the valuation process. Other respondents were less strict on the minimum number of comparables selected. For example, respondent 30 said he needs to find *"at least five comparables, that is the minimum for us. If we find less than five companies, the method is irrelevant to us".* Respondents 10, 11, 22, 28, 29, 31 and 32 use comparable analysis regardless of the total number of comparables found.

5.2.2 Sources of information

To calculate the average theoretical multiple, VCs have to look up the financial and valuation information of the selected comparables. However, the information on comparable companies is highly fragmented. Especially for comparable transactions, there is not one source from which VC retrieve all the necessary information. Designated VC and M&A databases are convenient as they automatically generate a peer group on each company's profile page, including valuations as stated by respondents 9, 14, 19, and 33. However, various respondents affirmed that these databases fail to transparentise the financials of private businesses as they rarely report the revenue or other financial metrics of private businesses. Therefore, it is challenging if not impossible to calculate multiples based on the information from designated VC and M&A databases alone. For this, VCs use other sources such as fellow investors, internal databases and advisor research reports.

The analysis shows that VC-oriented M&A databases are the most popular source of information, with half (50%) of the VCs in the sample using at least one. 12 (33%) VCs mentioned using Crunchbase, and 11 (31%) PitchBook to track down the financial information of comparables. However, these databases do not have all the necessary information on all companies, as stated by respondents 19 and 24. On top of that, some respondents pointed out that the information available in CrunchBase and PitchBook is not always accurate. Respondent 9 occasionally compares the financials of their portfolio companies with the information available in these types of databases and concludes that *"these information sources contain much noise"*. Therefore, the data on comparables in VC-oriented M&A databases must be taken with a grain of salt. Other VC & M&A databases mentioned by respondents are Dealroom.co (14%), Merger Markets (8%), Preqin (3%), and Traxcn (3%). Another 2 (5%) VCs also rely on publicly accessible databases found through web searches.

An alternative for VC-oriented M&A databases is external research reports, used by 11 (31%) VCs in the sample. 2 (6%) VCs occasionally receive research reports from advisors. 1 (3%) respondent sporadically uses research reports from consulting firms. Despite being repeatably mentioned in the pilot interviews, only 1 (3%) specifically referred to benchmark reports published by renowned

VC firms. Furthermore, 3 (8%) respondents receive broker research reports from investment banks containing the valuation multiples of companies in different industry verticals. For example, respondent 1 explains that he receives "*the data for fintech from Credit Suisse every month […]. It is a PDF with 50 pages, and every publicly listed fintech business is included in this report*". Similarly, 3 (8%) VCs are dependent on external research institutes such as the software equity group, which publishes trading multiples and M&A multiples of various industry verticals quarterly. Lastly, 1 (3%) investor mentioned Delphi Digital, a crypto research platform.

Some VCs also rely on their portfolio (3%) and evaluated deals (19%) to form an idea of the valuation multiples of private companies. Respondent 28 mentioned that, at his firm, they *"have a very structured internal database that comprises all deals we have looked into in the last few years. […] many businesses reappear with a different logo and a different name".* 22% of the VCs in the sample have such internal databases. The danger of these internal databases is that they are subject to selection bias. These databases only contain businesses which the VC decides to include. Therefore, if a firm solely invests in higher-quality start-ups which have always been expensive, the multiples in the internal database may not represent the broader market average.

Furthermore, the analysis shows that VCs also rely on public sources to find information on transactions. For example, 25% of the sample's VCs have referred to websites and news outlets as possible alternatives to the pricy VC-oriented databases and research reports. 7 (19%) respondents track down information on comparables through desktop research. 2 (6%) VCs sporadically fall back on newspaper articles from the financial times or other leading sources of financial news. Also, online news outlets such as TechCrunch and IntoTheBlock were mentioned by 1 (3%) respondent. In most cases, these sources only report the post-money valuation or the transaction value but not the business financials. For this, the VC has to rely on other sources.

While some researchers claim that the information transfer between VCs is limited, I find that 10 (28%) rely on word-to-mouth information. More specifically, 7 (19%) regularly consult industry insiders for valuation information. 3 (8%) admit to occasionally talk to fellow VCs and existing shareholders in the comparable companies for information about companies. For example, respondent 6 said: *"here in the Netherlands, more than half of all investment companies are within a half-hour drive of each other. You come across them everywhere at all sorts of events. So, we talk about it and get a sense of what other firms are paying."* Furthermore, respondent 11 said that *"we rely a lot on our network […] because there is actually quite a lot of information shared between the different venture capital firms if it is not a direct competitor."* Respondent 11 further elaborates: *"of course, it is always this for that. If we call, we also have to provide information. For us, this approach works very well. You never get all the ins and outs of a particular transaction but at a high level you can easily get a picture if you ask the right questions."* The approach of calling other VCs was also cited by respondent 30 and 33.

Information on publicly traded is easier to track down as it is widely available in repositories of stock exchanges or the security and exchange commission. 3 (8%) VCs specifically consult filed financial statements to calculate valuation multiples. In addition, 6 (14%) respondents rely on indices of public companies. For example, SaaS capital publishes the valuation multiples of quoted SaaS companies each quarter and reports the industry average valuation multiples. So, indices pre-select a wide range of companies making it easier for the VC to find comparable businesses in the same industry. Despite the widely available information on quoted companies, 6 (17%) VCs still use public company databases to streamline the search process. For example, 5 (14%) referred to Capital IQ as a valuable source for finding similar businesses and their

corresponding financial and valuation information. 1 (3%) VC has developed a software application to track down comparable businesses and keep their valuation multiples up to date.

5.2.3 Multiple types

After VCs have selected comparable companies and obtained the necessary information, the theoretical valuation multiple based on comparable companies is calculated. As shown in Table 7, I find that revenue multiples are significantly more prevalent amongst VCs in the sample than other multiple types which is in line with the results of Van Laere (2020). Consequently, hypothesis 1 is accepted. 78% of the respondents reported to always use revenue multiples in the valuation process. This includes sales and ARR denominators of which the ARR is the most prevalent, as stated by respondents 3, 11, and 19. 17% mention using revenue multiples often. No VC has indicated to use a revenue multiples half of the time. 3% of the respondents seldomly or never use it. The usefulness of an ARR multiple in the valuation process depends on the motive of the transaction. As respondent 11 explains, *"if one buys a company purely for the IP, the ARR multiple is completely irrelevant. Whether it is 100, 50 or 20 does not matter. […] So, the more you are in the DeepTech space, the less the ARR multiple will matter."* Besides the motive of the transaction, respondent 23 mentioned that *"the type of the multiple also highly depends on the business model"*. He elaborated that *"for B2B SaaS solutions. The multiple is for sure ARR",* which was echoed by respondents 3 and 26.

Table 7 – Frequency of use of valuation multiple type (never=0, always=4)

	EBITDA	EBIT	FCF	Employee	Customer	Other
Mean	1.06 (1.53)	0.33 (0.76)	0.17 (0.70)	0.17 (0.56)	0.47 (1.00)	0.31(0.95)
Revenue mean	3.64 (0.87)	3.64 (0.87)	3.64 (0.87)	3.64 (0.87)	3.64 (0.87)	3.64 (0.87)
Mean difference	-2.58^{***}	-3.31^{***}	-3.47^{***}	-3.47^{***}	-3.17^{***}	-3.33^{***}
Observations	36	36	36	36	36	36

Notes: significant differences between multiple bases: paired t-test: * p < 0.05; ** p < 0.01, *** p < 0.001; For each multiple type, the mean and the standard deviation (between brackets) are reported.

I find that EBITDA and EBIT multiples are far less common in VC today. Only 14% of the samples' VCs affirm to always use EBITDA multiples in the valuation process of start-ups and 11% often. Similarly, as for revenue multiples, 0% of respondents rely half of the time on EBITDA multiples and 17% seldomly. 58% confirmed to never apply EBITDA multiples. EBIT multiples are even less prevalent. No VC has said to always use an EBIT multiple in the valuation process. Unsurprisingly, 78% of the sample's VCs never use it. 17% affirm to consider EBIT multiples seldomly and 6% of respondents have reported to often rely on it. Furthermore, free cash flow (FCF) multiples are just like EBIT and EBITDA multiples rarely used. 92% of the respondents said to never use it. Contrarily, 3% of the VCs report to always use the FCF multiple. 6% seldomly rely on the FCF multiple when valuing software start-ups. Respondent 10 explained why EBITDA, EBIT and FCF multiples are not prevailing in the VC context. He said that *"within this industry, we invest in companies that are losing money. Once they turn out to be profitable, private equity players join the table which is a completely different from VC".* Respondent 11 also confirmed that the EBIT and EBITDA multiples are irrelevant as start-ups are usually EBIT(DA) negative, in line with the arguments of (Damodaran, 2009).

Damodaran (2018) shows that start-ups can also be valued with non-financial multiples in the early stages of development. Two denominators included in this study are employees and customers. The employee multiple is only used by 3% of the VCs in the sample. 8% affirm to consider valuing a start-up with this multiple seldomly. However, 89% of the VCs have never even used the number of employees as a denominator. The VCs that use the employee multiple apply it as a sanity check in most cases. Respondent 22 said: *"I like the employee multiple, but it is more a sanity check. For example, if you have a company of comparable size and product. What is the revenue that they are generating per employee? Subsequently, we try to apply that ratio as well"*. However, the customer multiple is more prevalent than the employee multiple amongst the firms in my sample. 3% of the VCs surveyed indicated always using a customer multiple in valuation with comparable analysis. 6% rely on this multiple often and 3% half of the time. However, 14% of the respondents seldomly apply a customer multiple to value software businesses. Despite some VCs using the customer multiple, 75% have reported never using it. In general, most respondents were sceptical of non-financial multiples as they believe that these multiples do not accurately reflect the businesses' value. If the business does not have any financial metrics yet, it is better to side with other valuation methodologies, as mentioned by respondent 18.

Lastly, I asked every respondent if they used other multiple types besides the ones listed in the questionnaire. 3% of the sample's VCs reported consistently using alternative multiples not listed in the questionnaire, 6% often, and 3% seldomly. 89% do not apply alternative multiple types. The VCs that use other multiples refer to the customer lifetime value (CLV), operating leverage, gross profit, and revenue growth multiple. CLV is a crucial metric that represents a customer's overall value to a company throughout their relationship. Operating leverage is the degree to which a company may enhance operating income by growing sales. A business with significant operating leverage generates revenues with a high gross margin and low variable costs. Gross profit is calculated by subtracting the costs of goods sold from the revenue. The operating leverage and gross profit multiple were only mentioned by late-stage investors as companies have to show signs of profitability to apply these types of multiples.

5.3 The relative importance of factors

In the valuation process of start-ups, VCs take into account various factors to arrive at the multiple that they will use in the valuation process. Respondent 10 explained that *"when we value the new investment, we look at the size of the market and the size of the opportunity within the market, the quality of the team, the funding need, the traction and growth momentum, and internal market competition, and the competition between VCs."* Of course, some factors will be more value relevant than others in the eyes of the investor. Therefore, the importance of each factor can be theoretically modelled as a relative weight score. So, this section will elaborate on the relative importance of momentum, market, technology, management, and money in determining the multiple used to value software start-ups.

While most venture capitalists seek to invest in firms with an excellent business and competent management team, some claim to favour one over the other (Kaplan et al., 2009). In terms of valuations, I find that all factors matter in determining the multiple, but the management team just a little more. Across the two investment stages, management has an average relative weight score of 27.60 which is significantly higher than the other factors, as shown in Table 8. As a result, hypothesis four is accepted. Respondent 8 emphasised that *"in these early phases, management is simply key in combination with the market in which the company operates".* Momentum's score is slightly lower and comes in second place with an average relative weight score of 22.16.

Furthermore, the results confirm that market is value relevant as VCs across all stages assigned, on average, a relative score of 20.35 to this factor. Technology is fourth most important across all stages with a score of 17.67. The least important factor according to software VCs is money. Several respondents mentioned that most factors in the money category will not necessarily influence the valuation but rather the terms in the term sheet. As a result, Respondents assigned, on average, a relative weight score of 11.81 to this factor. The reason why all the relative weight scores are so close to each other is because valuation *"is always a combination of all these factors. If the start-up has awful management, we will simply not invest. So, management is really important, but market conditions also play a crucial role. If the money is problematic […], I will also not invest"* as stated by respondent 7.

Table 8 – T-test of the relative weight scores of factors across all investment stages

	Momentum	Market	Technology	Money
Mean	22.16 (7.48)	20.35 (7.63)	17.67 (6.08)	11.81 (5.88)
Management mean	27.60 (7.12)	27.60 (7.12)	27.60 (7.12)	27.60 (7.12)
Mean difference	−5.44**	−7.25***	−9.93***	−15.79***
Observations	49	49	49	49

Notes: Significant differences between multiple bases: paired t-test: * p < 0.05; ** p < 0.01, *** p < 0.001; For each factor, the mean relative weight score and the standard deviation (between brackets) are reported.

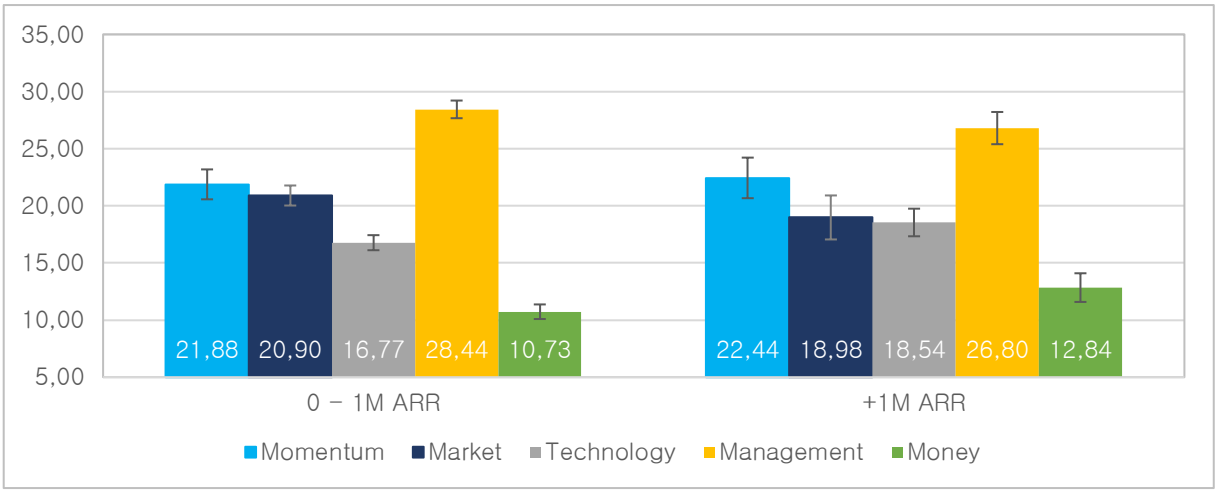
As shown in Figure 4, the differences in relative weight scores between the two investment stages are minor. Management remains the most important factor in both stages while being slightly more important in the 0–1M ARR stage. Investors often have very little information to base their valuation decision on in this stage. Most of the time, they are investing in a team with a minimum viable product (MVP) and a few first clients. So, many aspects of the business are still underdeveloped. As a result, the management team will weigh somewhat heavier in the valuation decision in the 0–1M ARR. Contrary to my expectations, technology is the fourth most important factor in determining the multiple in both stages. This is because *"technology is enabling in software"* stated by respondent 8. He further elaborated that *"technology has a subordinate role in software if you compare it with deeptech hardware. In pure software, technology is as good as irrelevant, especially if you compare it to the management team and the market dynamics"*.

Interestingly, technology is less important in the 0–1M ARR than in the +1M ARR stage. Start-ups in the 0–1M ARR stage usually dedicate most of their time to developing and improving their technology (Caselli, 2022), whereby the product and technology change continuously. Therefore, investors will consider technology to a lesser extent in the valuation decision of 0–1M ARR start-ups. Nonetheless, I hypothesised that technology is significantly more value relevant than momentum in the 0–1M ARR stage. Although respondent 9 affirms to mostly focus on the technology when deciding on the valuation, it is not significantly more value relevant than momentum. Based on the t-test's results, it became apparent that technology (M = 16.77, SD = 5.92) is instead significantly less important than momentum (M = 21.88, SD = 8.7); t(df) = 1.71, p = 0.032. As a result, hypothesis 2 is rejected.

Furthermore, I hypothesised that momentum would be significantly more value-relevant than technology in the +1M ARR stage (hypothesis 3), considering that start-ups mostly focus on marketing efforts to gain traction in this particular stage. Based on the t-test's results, it became apparent momentum (M = 22.44, SD = 6.25) is indeed significantly more value relevant than technology (M = 18.54, SD = 6.22); t(df) = 1.71, p = 0.011. A statement of respondent 4

strengthens this finding. He said that *"if you are looking into a company that has traction, the product-market fit has been established, and as they are busy scaling the product, the metrics in the first box will become more important"*. Consequently, hypothesis 3 is accepted. Although there is a statistically significant difference, it is crucial to emphasise again that the factors are almost equally important from the investor's point of view.

Figure 4 - Relative weight scores of the valuation-influencing factors per stage



Notes: the relative weight scores are scores between 0 and 100. The sum of the 5 relative weight scores of momentum, market, technology, management, and money is 100 (without rounding errors).

As shown in Appendix 9, the additional analysis between sub-samples does not yield any significant results. Regardless, management remains the most important factor across all sub-samples. Generalist VCs tend to lay slightly more emphasis on momentum and money than specialist VCs. On the other hand, specialist VCs assign a larger relative weight to market, technology, and management, as they better understand the market dynamics and are more interested in the start-ups underlying technology. Momentum and management are more important for firms with multiple international offices than single-office firms; however, the differences (2.65 for momentum and 0.61 for management) are not significant. Single-office firms take the market and technology more into account. Nonetheless, the difference in relative weight scores between market and technology for single-office and multiple-office firms is minor. VCs with no institutional investors find momentum, technology and money slightly more important than VCs with institutional investors. For management and market, it is the other way around. Despite deeptech investors' focus on software start-ups with complex underlying technology (AR/VR, Big data, AI), the minor difference in the technology's relative weight score is not significantly different ($p = 0.365$) between deeptech investors ($M = 18.89$, $SD = 5.89$) and non-deeptech investors ($M = 17.18$, $SD = 5.27$). This emphasises once again that technology plays a subordinate role in the valuation of software start-ups.

5.4 Deviations from the theoretical multiple

Because of the perceived favourability of momentum, market, technology, management, and money, VCs may offer multiples that deviate from the theoretical multiple. For example, suppose a specific factor is perceived as favourable by investors. In that case, they will be more inclined to offer a higher multiple, whereas the contrary is true when a factor is perceived as unfavourable. In other words, the VC's perception of factors largely determines their valuation behaviour and,

ultimately, the multiple use in the deal. This valuation behaviour is quantified by asking VCs how many per cent (%) they would deviate from the theoretical multiple if they perceive a factor as significantly below average, below average, above average, or significantly above average. These deviation percentages are discussed in 5.4.1. On top of the deviations resulting from the favourability of factors, VCs occasionally apply standardised mechanical adjustments regardless of the factors' favourability. This is discussed in sub-section 5.4.2.

5.4.1 Factor deviations

Despite relative weight scores for all factors being fairly similar, the differences in deviations from the theoretical multiple due to factors are more pronounced. The analysis confirms that management and momentum are negotiating factors for start-up founders to enforce higher valuations because VCs are willing to pay the largest premiums for these two factors. VCs deviate on average +57% from the theoretical multiple if a start-up has a significantly above average management. They pay these premiums because they believe that the chances of losing money are drastically reduced when the start-up is led by competent founders, as explained by respondents 6 and 9. Significantly above average momentum is rewarded with a 41% increase. The market and technology are slightly less value relevant as the VCs in the sample pay a lower premium of +29% for both factors if perceived as significantly above average. Respondents 3, 5, and 6 mentioned why they are willing to pay more for a market and technology in their interview. They emphasised that start-ups with a strong USP in a large market have the potential to become market leaders. Every VC wants these types of start-ups in their portfolio, so it is not surprising that premiums are being paid for the market and technology as well. Significantly above average money will not move the needle much as VCs are only willing to pay +11% extra.

Table 9 – VCs that will not invest if they perceive a factor as (significantly) below average

	Significantly below average		Below average	
	N	%	N	%
Momentum	15	54%	6	21%
Market	21	75%	10	36%
Technology	20	71%	9	32%
Management	24	86%	12	43%
Money	15	54%	9	32%

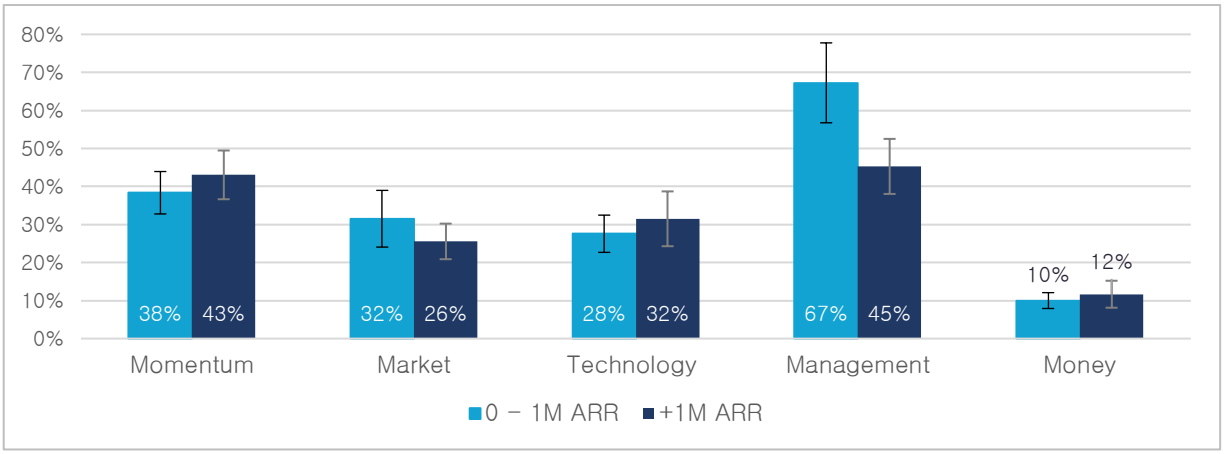
Notes: this graph shows the absolute number of VCs (N) and the percentage of the sample (%) that opt out of the investment if they consider a specific factor as (significantly) below average.

Overall, VCs will not deviate much from the theoretical multiple when the factors are considered above average. Respondent 3 explains that the deviations for above average factors are minor because *"our willingness to pay more is more binary. If we are really impressed, we are willing to pay premiums"*. From all the factors, an above average management will move the needle the most with a +18% increase. Momentum's premium is slightly lower standing at 15%. When a start-up is embedded in an above average market and has an above average technology, VCs would be willing to deviate +12% and +10% respectively. The multiple adjustment for an above average money is almost negligible standing at +4%. A structured overview of all deviations is shown in Appendix 10.

Furthermore, VCs rarely adjust the theoretical multiple downwards when they perceive factors as unfavourable. This is because they will, in most cases, not invest in these businesses. VCs assess hundreds of start-ups to only invest in a handful of businesses each year. As a result, start-ups with below average factors will rarely make the cut and will not be offered a term sheet. Respondent 3 said: *"every start-up that is mediocre from day one will remain mediocre because there is a reason why it is mediocre"*. Therefore, VCs do not want to have these companies in their portfolio. Table 9 reports the number of VCs that explicitly mentioned not to invest when a single factor is perceived as either below average or significantly below average. Amongst the sample's VCs, the start-up's management is the biggest dealbreaker. Respondent 3 explained that *"if the management team is not in line with the quality of management teams we have seen before, we will not invest. We define the average as a good management team; this is by definition the reference point that we use, that is the threshold"*. As a result, it is of utmost importance to show VCs that there is a solid management team in place to maximise the chances of being funded.

Table 9 also shows that (significantly) below average momentum and money are the least frequent deal-killers. So, momentum and money will become negotiating factors when below average. For example, VC might leverage a below average momentum to convince entrepreneurs that the quality of their business does not justify their requested valuation and subsequently pressure them to accept a lower valuation. From a money perspective, the funding need could be too high due to overly ambitious growth plans or low capital efficiency. In this case, Investors will likely renegotiate the growth plans, the capital allocation, and the funding amount instead of killing the deal immediately. Additionally, previous valuations may also be leveraged by VCs in valuation negotiations. For example, when founders raise money in a down round, they no longer have the bargaining power to determine the valuation as they desperately need the capital. Therefore, VCs might use this to lower the valuation to compensate for the additional risk of investing in a distressed business.

Figure 5 – Deviation from the theoretical multiple when factors are significantly above average



Not all investors in the sample immediately write off an investment opportunity if they consider one factor unfavourable. This is because they are less risk-averse, have lower quality deal flow, or have a social role to play as governmental VC. For example, respondent 14 explained that *"if technology and management are significantly below average, we will be at the bottom of the valuation range given our social role as an investor. These two factors will not be deal breakers*

Table 10 – Pearson's correlations of proxies for experience, control variables, and significantly above average multiple deviations

Variable		Age	Number of funds	Fund size	Multiple offices	Generalist	Institutional LPs	HNWI largest LP	DeepTech	Momentum	Market	Technology	Management	Money
1. Age	Pearson's r	—												
	p-value	—												
2. Number of funds	Pearson's r	0.377 *	—											
	p-value	0.048	—											
3. Fund size (log)	Pearson's r	0.619 ***	0.319	—										
	p-value	< .001	0.113	—										
4. Multiple offices	Pearson's r	0.068	0.372	0.376	—									
(dummy)	p-value	0.731	0.051	0.059	—									
5. Generalist	Pearson's r	0.434 *	0.121	0.280	0.132	—								
(dummy)	p-value	0.021	0.539	0.165	0.502	—								
6. Institutional LPs	Pearson's r	−0.396 *	−0.013	−0.225	0.240	−0.106	—							
(dummy)	p-value	0.037	0.948	0.270	0.218	0.593	—							
7. HNWI largest LP	Pearson's r	−0.296	−0.250	−0.425 *	−0.034	−0.258	−0.164	—						
(dummy)	p-value	0.126	0.199	0.030	0.863	0.185	0.406	—						
8. DeepTech	Pearson's r	0.249	0.140	0.202	−0.076	0.577 **	−0.219	0.000	—					
(dummy)	p-value	0.202	0.478	0.323	0.699	0.001	0.262	1.000	—					
9. Momomentum	Pearson's r	0.167	0.496 **	0.298	0.432 *	0.152	0.239	−0.161	0.080	—				
(Log)	p-value	0.395	0.007	0.140	0.022	0.439	0.221	0.414	0.686	—				
10. Market	Pearson's r	0.051	0.120	0.224	0.199	0.032	0.140	−0.263	0.083	0.457 *	—			
(Log)	p-value	0.797	0.544	0.271	0.309	0.872	0.477	0.176	0.673	0.014	—			
11. Technology	Pearson's r	−0.109	−0.324	−0.206	−0.042	−0.105	0.248	0.088	0.042	0.254	0.339	—		
(Log)	p-value	0.581	0.092	0.312	0.832	0.594	0.203	0.657	0.831	0.193	0.078	—		
12. Management	Pearson's r	−0.086	0.197	0.008	0.398 *	−0.235	0.270	0.021	−0.335	0.714 ***	0.500 **	0.462 *	—	
(Log)	p-value	0.664	0.315	0.971	0.036	0.228	0.164	0.916	0.081	< .001	0.007	0.013	—	
13. Money	Pearson's r	−0.175	−0.246	−0.266	−0.021	−0.153	0.271	0.095	−0.098	−0.066	0.104	0.385 *	0.069	—
(Log)	p-value	0.373	0.207	0.188	0.916	0.436	0.162	0.632	0.619	0.740	0.598	0.043	0.728	—

* p < .05, ** p < .01, *** p < .001

Notes: Fund size and the significantly above average multiple adjustment for momentum, market, technology, management and money are logarithmically transformed to adjust the data for outliers

for us". For the VCs that do not refrain from investing when factors are unfavourable, a significantly below average market (−41%) and management (−39%) result in the biggest multiple corrections. Start-ups with a significantly below average momentum, technology, or money can expect a negative adjustment of −20 to −30% for each factor. Interestingly, there is hardly any difference between the significantly below average and below average momentum and technology adjustments. In contrast, the difference is more pronounced for the market, management, and money. VCs, on average, deviate −21% for momentum, −25% for market, −20% for technology, −27% for management, and −12% for money when these factors are perceived as below average. In conclusion, the results show that it is not impossible to raise capital from VCs when some factors are suboptimal; however, valuations will suffer from the additional risks that VCs associate with unfavourable factors.

As shown in Figure 5, the significantly above average multiple deviations in both investment stages are fairly similar for all factors, apart from management. It is incredibly risky to invest in 0–1M ARR start-ups because many aspects of the business are still underdeveloped. The management team is crucial in this phase because they still have to get the business off the ground. Therefore, the management team is somewhat the only factor that gives 0–1M ARR VCs some indication of the potential future success of the business. Considering the bigger chances of an experienced management team building a full-fledged business, it is not entirely surprising that 0–1M ARR investors are willing to pay higher premiums for outstanding management. Interestingly, the analysis shows that the management premium is 22% lower in the +1M ARR than in the 0–1M ARR stage. Respondent 14 explained that most start-ups with bad management go under before reaching 1M in ARR, so there is a less notable quality difference between management teams in later stages. Therefore, investors will be less inclined to pay more for exceptional management teams in the +1M ARR stage.

In section 3.2, I hypothesised that more experienced VCs pay higher premiums for exceptional momentum and management because they invest more frequently in high-quality companies with this momentum. The analysis for the potential moderating effect of VC experience was conducted using a linear regression model in JASP. As a first step, the mutual correlations of the proxies for experience (age, number of funds and fund size), the dummy variables, and the significantly above average deviations for the five factors were calculated and presented in Table 10. Surprisingly, I only find weak and moderate correlations between the proxies for VC firm experience. More specifically, Table 10 shows that older firms have more funds under management. Most VCs raise new funds every five years to minimally have one fund with which they can invest in new opportunities. Considering the standard 10-year lifecycle of closed-ended funds, the first 5 years are for investing in new opportunities while the last 5 years are primarily for divesting the equity positions and returning money to LPs (Caselli, 2022). By raising a new fund every 5 years, a VC can be both disinvesting one fund and actively investing in new start-ups with the consecutive fund at any given time.

Because VC is a high-risk asset class, many LPs need to ensure that the expected return of venture funds justifies the risk. Investing in someone with a proven track record can provide that comfort. Therefore, older VCs with a more extensive track record can raise more capital from LPs as they can demonstrate consistent returns over time. This explains the significant positive correlation between age and fund size. Institutional LPs are often the most difficult to convince. Therefore, the significant negative correlation between institutional LPs and age is rather remarkable but may be a consequence of the small sample size. When VCs raise larger funds, this capital can often not be invested in one specific industry vertical alone. As a result, this explains why older VCs identify more often as generalists instead of specialists. Unsurprisingly,

the dummy variable "generalist" is positively correlated with the dummy variable "deeptech" because generalists invest in a broad range of industry verticals, including deeptech.

Furthermore, there are also significant correlations between the independent variables. For example, VCs who pay higher premiums for exceptional management also reach deeper into their pockets for a significantly above average momentum, technology, and market. Although it is not a one-to-one correlation, investors who deviate more from the theoretical multiple for management also tend to pay more for momentum, market, and technology. On top of that, VCs who pay larger premiums for the market also do this for momentum. Moreover, I also find a positive correlation between the significantly above average deviations of money and technology.

Additionally, Table 10 demonstrates predominantly weak and insignificant correlations between the proxies for VC firm experience and the significantly above average theoretical multiple deviations of market, technology, management, and money. However, I do find that the number of funds (proxy for VC firm experience) is significantly positively correlated with the significantly above average momentum deviation. A linear regression (model 1 in Table 11) was conducted to examen how well the number of funds (X_1) could predict the significantly above average momentum deviation while controlling for multiple offices (X_2), VC type (X_3), and institutional LPs (X_4). A scatterplot showed that the relationship between the number of funds and the significantly above average momentum deviation did not reveal any bivariate outliers. An analysis of the standard residuals showed that the data contained no outliers (Std. Residual Min. = −2.25, Std. Residual Max. = 2.14). Independence of residual errors was confirmed with a Durbin-Watson test (d = 2.017). Residual plots showed homoscedasticity and normality of the residual.

Table 11 – Linear regression results of the significantly above average momentum and management deviation and VC firm experience

Independent Variables	Model 1	Model 2
Number of funds	1.15 (0.04)	1.05 (0.53)
Controls for		
Generalist (dummy)	1.15 (0.58)	–
Institutional LPs (dummy)	1.34 (0.26)	–
Multiple offices (dummy)	1.40 (0.25)	1.81 (0.25)
DeepTech (dummy)	–	0.58 (0.08)
R^2	0.36	0.26
P-value	0.031	0.057
Intercept	15.65	40.17
Observations	27	27

Notes: the dependent variable is the significantly above average momentum deviation (in %) in model 1 and the significantly above average managment deviation (in %) in model 2. The independent variable number of funds is a proxy for VC firm experience. Generalist, institutional LPs, multiples offices, and DeepTech are dummy variables. If the VC firm is mentioned to be a generalist in the interviews, the dummy variable "generalist" is one and zero when it is a specialist firms. If the VC has institutional investors among its LP base, the value of institutional LPs is one and otherwise it is zero. If the VC has multiple international offices, the multiple office value is one and zero for single office firms. Lastly, if the VC invests in DeepTech, the value of DeepTech is one and zero if they do not invest in these types of start-ups. For each of the variables, the coefficient and the corresponding p-value (between brackets) are reported.

Table 11 shows that the number of funds statistically significantly predicts the significantly above average momentum deviation, accounting for 35.8% of the variability. The regression equation for predicting the significantly above average momentum deviation from number of funds is $\hat{y}$ = 15.96% + 1.15% X1 + 1.40% X2 + 1.15% X3 + 1.34% X4. The confidence interval for the slope to predict the significant above average momentum deviation from the number of funds was 95% CI [1.01, 1.32] with a beta of 1.15; thus, for each increase in the number of funds, the significantly above average momentum deviation increases by about 1.01% to 1.32%. However, due to the small sample size, the linear regression model lacks the predictive power to confidently accept hypothesis 6. However, the second model in Table 11 shows that the number of funds does not statistically significantly predicts the significantly above average management deviation. Therefore, I conclude that more experienced VC firms do not necessarily pay higher premiums for exceptional management teams, whereby hypothesis 6 is rejected.

5.4.2 Standardised mechanical deviations

On top of the deviations resulting from the favourability of factors, VC also occasionally apply standardised mechanical adjustments. This is primarily to compensate for exit premiums paid in transactions, the lack of liquidity, and difference in size between the comparables and the start-up. Despite the recommendation of the International Private Equity and Venture Capital (2018) valuation guidelines to adjust the theoretical multiple for transaction premiums, illiquidity, and difference in size, 16 (44%) VCs affirmed to never apply standardised mechanical multiple corrections. The remaining 20 (56%) do adjust multiples sporadically. Respondent 1 mentioned that although *"start-ups are growing by double digits per month, it is tough to argue for a discount on the multiple derived from comparables, but it is the right thing to do".*

When the theoretical multiple is derived from comparable quoted companies, 10 (28%) VCs in the sample apply a fixed adjustment of -20% to -30%, compensating for the lack of liquidity of the start-up's shares. On the other hand, 7 (22%) other respondents adjust the theoretical multiple based on comparable quoted companies arbitrarily. These corrections remain subjective and can range up to -80%. According to the VCs in the sample, standardised adjustments of multiples based on comparable transactions are less common. Only 2 (6%) VCs adjust theoretical multiples based on comparable transactions for the premiums paid in exits and acquisitions. Another VC said that he also applies a discount on transaction multiples because *"you cannot compare the start-ups in which we invest with companies that have closed a Series C round in the US. This is a domestic market of 300 million people that is highly advanced considering VCs and technology development",* as stated by respondent 3. However, he further elaborated that this adjustment varies on a case-by-case basis.

5.5 Multiples paid for software deals

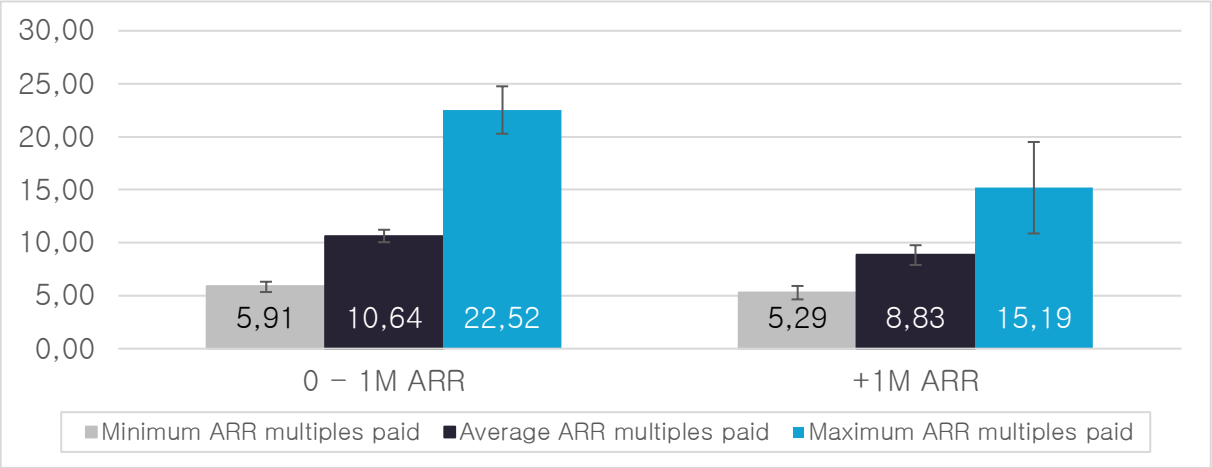
Most often, the valuation in the term sheet is in reported in the form of a price per share (Caselli, 2022). However, the valuation can also be expressed as a multiple. Therefore, this study has mapped out the ARR multiples paid for software deals for two reasons. First, entrepreneurs will better understand what multiples are being paid by VCs when writing this thesis. Second, by collecting the multiples paid, I can explore the moderating effect of VC firm experience on pre-money valuations of software start-ups. The data is contained in the form of ARR multiples paid because this study has shown that this is the most commonly used multiple by software VCs.

The analysis shows that the sample-wide minimum ARR multiple paid is 5.21x, the average multiple is 9.33x, and the maximum multiple is 18.00x. It is crucial to note that these multiples

highly depend on public market conditions (Gompers et al., 2008). Due to historically low interest rates, SaaS Indices show that the valuation in both public and private markets have increased drastically over the last couple of years (Belcher, 2021). Respondent 31 explained that high valuations do not necessarily rule in favour of the entrepreneur as assumed by many: *"valuations should never be stretched too much. When the market is too good for VCs (low valuations and low competition), VCs should not take advantage of the founders by demanding 30% instead of 20% of equity for the same valuation. It will demotivate the founders. Nevertheless, the opposite is true if the VC can only buy a 10% equity stake because of the high valuation. We will be less motivated to help the founder and spend more time helping another portfolio company".* As a result, valuation is a double-edged sword; greed from both sides is not good.

However, valuations in Europe are not as inflated as in the US. In 2021, the top 100 (US) private businesses commanded a 34x ARR multiple on average (D'Onofrio & Teng, 2021). Even the average maximum ARR multiple of 18x found in this study does not come close to the average ARR transaction multiple of 34x. The discrepancy in valuation may be attributed to the maturity of the VC industry and strong stock market. Additionally, US start-ups and private businesses have a much larger domestic market, allowing them to grow faster than in Europe, whereby higher valuations are more easily justified.

Figure 6 - Adjusted minimum, average, and maximum ARR multiples paid per stage



Furthermore, Figure 6 shows that the paid ARR multiples are higher for start-ups with 0-1M ARR than start-ups with +1M ARR. In the earliest investment stages, investors want to ensure that the founders remain majority shareholders of the company to have enough skin in the game. Because businesses in the 0-1M ARR stage have relatively high funding needs compared to their turnover, applying a standard valuation multiple (e.g. 7x) will yield a relatively low pre-money valuation compared to the funding need. As a result, striking deals at such low valuations will excessively dilute the founder's equity stake. It is in the VC's best interest to avoid this as, on the one hand, it will demotivate the founders. On the other hand, it will hamper the chances of raising consecutive funding rounds as late-stage investors still want to see the management own a substantial part of the company after the Series A round. Therefore, VCs will pay higher multiples in the 0-1M ARR stage. As a result, dilution plays an essential role in determining the multiple in the earliest investment stages. Apart from the difference in the multiples paid between stages, I also explored the differences in multiples paid between various sub-samples. However, the differences are rarely significant, as shown in Appendix 9.

Table 12 – Pearson's correlations of proxies for experience, control variables, and ARR multiples paid

Variable		Age	Number of funds	Fund size	Multiple offices	Generalist	Institutional LPs	HNWI largest LP	DeepTech	Min ARR multiples	Average ARR multiple	Max ARR multiples
1. Age	Pearson's r	—										
	p-value	—										
2. Number of funds	Pearson's r	0.380 *	—									
	p-value	0.027	—									
3. Fund size (log)	Pearson's r	0.611 ***	0.313	—								
	p-value	< .001	0.081	—								
4. Multiple offices	Pearson's r	0.031	0.238	0.299	—							
(dummy)	p-value	0.864	0.175	0.096	—							
5. Generalist	Pearson's r	0.435 *	0.099	0.308	0.262	—						
(dummy)	p-value	0.010	0.579	0.086	0.134	—						
6. Institutional LPs	Pearson's r	−0.410	0.004	−0.163	0.243	−0.160	—					
(dummy)	p-value	0.016 *	0.983	0.373	0.167	0.365	—					
7. HNWI largest LP	Pearson's r	−0.291	−0.299	−0.443 *	0.029	−0.219	−0.132	—				
(dummy)	p-value	0.095	0.085	0.011	0.873	0.212	0.455	—				
8. DeepTech	Pearson's r	0.282	0.130	0.248	0.049	0.600 ***	−0.290	0.049	—			
(dummy)	p-value	0.106	0.463	0.172	0.782	< .001	0.096	0.782	—			
9. Min ARR multiples	Pearson's r	−0.246	−0.054	0.011	0.101	−0.127	0.242	−0.067	−0.077	—		
	p-value	0.160	0.762	0.953	0.571	0.473	0.169	0.706	0.665	—		
10. Average ARR multiple	Pearson's r	−0.220	0.018	0.144	0.268	−0.196	0.159	0.044	−0.163	0.758 ***	—	
	p-value	0.212	0.920	0.431	0.126	0.266	0.369	0.803	0.358	< .001	—	
11. Max ARR multiples (log)	Pearson's r	−0.181	0.015	0.176	0.241	−0.138	0.155	0.050	−0.073	0.729 ***	0.974 ***	—
	p-value	0.307	0.934	0.335	0.170	0.437	0.381	0.779	0.683	< .001	< .001	—

* p < .05, ** p < .01, *** p < .001

Notes: Fund size and the maximum ARR multiple paid logarithmically transformed to adjust the data for outliers.

Previous research has demonstrated that VC firm experience significantly affects pre-money valuations. However, academics disagree on whether this has a negative or positive effect. D. Hsu (2004), Falik et al. (2016), and Bengtsson and Sensoy (2011) argue that more reputable VCs strike deals at lower valuations because they have more bargaining power. However, Gompers et al. (2010) debunk the bargaining theory as they demonstrate that experienced VCs pay higher valuations instead of lower valuations. Nevertheless, the applicability of the original bargaining theory ultimately depends on the competitiveness of the VC market. An experienced VC explained that *"there is a big discrepancy between value and price in the market".* He further elaborated that there is a record amount of money being deployed in the VC asset class and *"VCs are willing to pay crazy sums of money for deals these days"*. Therefore, you can be the most experienced investor, but *"if you do not match the inflated valuations offered by other firms, you will not strike a single deal"*. Respondent 5 elaborated on this. He mentioned that *"most firms today are not disciplined. Tiger Global, for example, do deals within a weak and offers a 100x ARR multiple. They truly believe they are investing at the forefront of a new revolution and taking positions early and fast is critical"*. He added that *"it almost feels like a gold rush"*. Time will tell whether this greedy behaviour is a harbinger of a new VC bubble that will deflate when public market valuations drop due to increasing interest rates and changes in monetary policy.

Table 12 shows the correlation between the proxies for VC firm experience, dummies, and dependent variables. It becomes apparent that the independent variables are only weakly correlated to the ARR multiples paid. This is a first indication that VC firm experience is not an explanatory factor for the multiples paid based on this study's data. Interestingly, not all proxies for VC firm experience have the same correlation direction. For example, age happens to be negatively correlated to the ARR multiple paid, whereas the two other proxies are positively correlated. Unfortunately, this is a harbinger of the linear regression model's low predictive power due to the low sample size.

Table 13 – Linear regression model of the average ARR multiple paid and VC firm experience

Independent Variables	Model 1	Model 2
Age (years)	−0.06 (0.49)	–
Fund Size (€M)	–	0.002 (0.54)
Controls for		
Generalist (dummy)	2.61 (0.25)	−2.05 (0.16)
Multiple offices (dummy)	−1.76 (0.08)	2.81 (0.054)
R^2	0.16	0.17
P-value	0.15	0.15
Intercept	10.06	9.08
Observations	33	31

Notes: the dependent variable is the average ARR multiple paid. Age and fund size are proxies for VC firm experience. Generalist, institutional LPs, multiples offices, HNWI biggest LP, and DeepTech are dummy variables. If the VC specialises in more than six focus areas, the value of generalist is one and otherwise it is zero. If the VC has institutional investors among its LPs, the value of institutional LPs is one and otherwise it is zero. If the VC has multiple offices, the multiple office value is one and while it is zero for single office firms. If the firm's largest LP are HNWI, the value of HNWI biggest LP is one and otherwise it is zero. Lastly, if the VC invests in DeepTech, the value of DeepTech is one and zero if they do not invest in these types of start-ups. For each of the variables, the coefficient and the corresponding p-value (between brackets) are reported.

Nevertheless, two linear regressions were conducted to explore the conflicting correlations of age and fund size with the average ARR multiple, as shown in Table 13. The influence of the number of funds is not investigated due to the low Pearson's r correlation coefficient implying that both variables are uncorrelated. A second indication that VC firm experience does not accurately predict the average ARR multiples paid based on this study's data. An analysis of the standard residuals showed that the data contained no outliers in Model 1 (Std. Residual Min. = −2.443, Std. Residual Max. = 1.644) and in Model 2 (Std. Residual Min. = −1.943, Std. Residual Max. = 2.121). I confirmed the independence of residual errors with a Durbin-Watson test for Model 1 (d = 2.062) and Model 2 (d = 2.131). Residual plots showed homoscedasticity and normality of the residuals. However, the regression output of both models showed that VC firm experience does not statistically significantly predict the average ARR multiple paid. The low predictive power of the model is confirmed by the conflicting coefficients of the dummy variable "multiple offices" in both models, which is likely due to the small sample. As a result, VC firm experience does not seem to be an explanatory factor for the valuations offered based on the data of this study. Consequently, I rejected hypothesis 5.

6 Discussion and conclusion

6.1 Discussion

This research aims better to understand the investment valuation procedure with the emerging comparable analysis technique followed by software VC. The results of this study show that the five factors (momentum, market, technology, management, and money) all have an effect on the multiple used to value deals. In addition, this thesis also explores whether VC firm experience is an explanatory factor for the valuation behaviour associated with these five factors. First, sub-section 6.1.1 will evaluate the findings and incorporate a personal and literary perspective of the results. Possible limitations of this research project will be discussed in sub-section 6.1.2 and future research suggestions are presented in sub-section 6.1.3.

6.1.1 Key findings

Dittmann et al. (2004) and Manigart et al. (2000) show that comparable analysis has been a prevalent valuation methodology in mature VC markets prior to the dot-com period. However, the same academics argue that comparable analysis is still little used in Europe's emerging markets, such as the Benelux region. Interestingly, more recent studies (e.g. Pintado et al. (2007) and Van Laere (2020) show evidence that comparable analysis has risen in popularity in these markets. The results of my study complement these findings as the analysis shows that comparable analysis is the most frequently used valuation methodology among the European VCs in my sample. Therefore, it becomes clear that VCs in smaller markets, such as the Benelux region, have adopted the way of working of VCs from Anglo-American countries over the past 20 years. Consequently, the valuation procedure of start-ups has likely become more uniform across Europe. This uniformity can be attributed to the introduction of the international PE and VC valuation guidelines in 2018. As most VCs follow these guidelines, there are likely to be fewer cultural differences in the valuation process of VCs worldwide. As a results, the results of this study might serve as a blueprint for future studies documenting the practical application of comparable analysis outside Europe.

In contrast with the findings of Pintado et al. (2007), the results of this study show that comparable analysis is almost as prevalent in the 0-1M ARR stage than in the +1M ARR stage. However, it is

crucial to note that the 0–1M ARR stage results will not be meaningful for all start-ups. During the interviews, various seed investors mentioned that the valuation derived from multiples would mean relatively little start-up with very low revenues (e.g. 300k). For these types of start-ups, the valuation is primarily determined based on the dilution entrepreneur finds acceptable and less on the financials as these are insignificant. As a result, VCs will use of alternative valuation approaches such as reverse engineering (Van Laere, 2020). However, multiples based on comparables play an important role as a sanity check for companies with revenues closer to one million (e.g. 800k). For these types of start-ups, the 0–1M ARR stage results are still meaningful.

Comparing the findings of this study with prior research shows that there is a notable difference in the multiple types used in the valuation process between the dot-com period and today. Despite Karsai et al. (1997) and Manigart et al. (2000) saying that P/E and EBIT multiples are the most prevalent multiple types in comparable analysis, the results of this study show that revenue multiples are most used to value software start-ups, which complements the findings of Van Laere (2020) and confirms the first hypothesis. This is not very surprising when you look at the development of earnings and turnover for start-ups as sketched by Damodaran (2018). The difference in findings between Karsai et al. (1997), Manigart et al. (2000), and this study could be attributed to the sample composition. My sample only consists of seed (0–1M ARR) and early-stage investors that acquire equity stakes in very young businesses. However, the sample of Karsai et al. (1997) and Manigart et al. (2000) is relatively heavy on late-stage investors (expansion, replacement, and buy-out), which would be categorised as PE investors in today's taxonomy. This emphasises that little research has been devoted to the valuation process of genuine early-stage investors.

The selection of comparables is one of the most important steps in comparable analysis. Understanding this procedure is especially relevant for entrepreneurs who want to estimate the fair value of their business prior to negotiations with VCs. The analysis shows that VCs face multiple challenges in this process due to the lack of transparency of private company information and the too big of a difference between start-ups and companies listed on the stock exchange. Although academics primarily suggest selecting comparables based on financial metrics (Bhojraj et al., 2003; Dittmann & Weiner, 2005; Metrick & Yasuda, 2021), the results show that financial criteria are rarely used by the VCs from the sample. It is not that these criteria are irrelevant, but they struggle to find comparable companies with similar financials because (1) quoted companies are in different stages of development whereby they have a completely different financial profile, and (2) private businesses do not disclose their financial information. As a result, VCs are forced to reside to more top-level selection criteria such as industry, business model, and product offering. Still, the majority of the respondents mentioned that it is difficult to find more than ten comparables for start-ups. Even if VCs find ten or more comparables, it does not mean that the necessary information is available for all of them. Generally speaking, it seems that VCs have embraced all these limitations because it is an inherent part of start-up valuation.

In addition to the multiple derived from the comparables, certain factors linked to the start-up also play an important role in the valuation decision of VCs. While most VCs seek to invest in firms with an excellent business and competent management teams, some claim to favour one over the other (Kaplan et al., 2009). Some VCs feel that the company's business and market are the essential drivers of success, while others believe that the company's management is the most critical factor (Kaplan et al., 2009). This debate about whether one should bet on the management team (jockey) or the business (horse) is still ongoing. So far, this debate has mostly been about investment selection. However, the findings show that this debate is also ongoing in valuation. I find that all five factors (momentum, market, technology, management, and money) matter in

terms of valuation. However, the VCs in the sample put slightly more emphasis on the start-up's management when determining the multiple, confirming hypothesis 4. This is particularly interesting for entrepreneurs as they know now that all aspects of the business matter in the valuation decision of VCs. Various respondents emphasised the importance of the market in the valuation decision. Therefore, market conditions can be added to the ever-expanding list of valuation influencing factors in academic literature. The fact that all factors have more or less equal weights might result from risk-aversion. Manigart et al. (2002) show that French, Belgian, and Dutch VCs score relatively high on uncertainty avoidance compared to Anglo-American countries. As shown in Figure 3, the sample primarily consists of VCs from these countries. So, the VCs surveyed may be less inclined to take significant risks, whereby they weigh all factors approximately equally.

Furthermore, individual studies in the scientific literature show ambiguous results for the effect of VC firm experience on the valuation behaviour and the valuations offered for deals. For example, Falik et al. (2016), Bengtsson and Sensoy (2011), and D. Hsu (2004) find that entrepreneurs accept lower valuation offers from more experienced VCs as entrepreneurs expect superior value-adding services. As a result, more experienced VCs should have superior bargaining power over their less experienced counterparts. In contrast, Gompers et al. (2010) debunk this theory as they find that the opposite is true. It is especially relevant for entrepreneurs to better understand the valuation behaviour of more experienced firms because it will allow them to better prepare for valuation negotiations with the creme de la crème. However, the findings show that VC firm experience is not a strong predicting factor for either the average ARR multiples paid or the valuation behaviour related to the factors. This can be attributed to the small sample size, whereby the linear regression model lacked predictive power. Consequently, hypotheses 5, 6, and 7 could not be adequately tested. Nevertheless, in line with Sørensen (2007) and Cumming and Dai (2011), the results show that VCs with more funds under management pay higher premiums for start-ups with significantly above average momentum because they may invest more frequently in higher-quality businesses with exceptional traction which command higher multiples. As a result, they will have to deviate more from the multiple based on comparables to strike deals.

Lastly, this study is conducted at the time of historically-low interest rates, record-breaking capital allocation to private markets (Invest Europe, 2021; National Venture Association, 2021), fierce competition between VC firms, and strong public equity market performance. All these phenomena have led to a rapid increase in private market valuations. This clarifies that private market valuations are highly dependent on the broader economic environment. As a result, the ARR multiples reported in this study will be no longer representative when changes in the economic environment occur. Moreover, Gompers et al. (2008) show that VC activity is tied to valuations in public equity markets. Apparently, the rising value of IPOs encourages VCs to raise bigger funds (Gompers et al., 2008). Because of this, they have at times more gunpowder, whereby they may show more aggressive valuation behaviour when public equity markets are hot. So, it may well be this behaviour will also fluctuate over time due to changes in the economic environment. As a result, the findings of this study may not necessarily apply in a VC market downturn.

6.1.2 Limitations

The aforementioned results present multiple important limitations that need to be considered. To begin with, the methodological choice was constrained by the time that VCs were willing to dedicate to this research. VCs did not want to be interviewed for longer than 30 minutes. Unfortunately, this time constraint impacted the entire research design of this study. Therefore,

experiments could not be carried out to study the practical application of comparable analysis in several investment cases. This forced me to explore the practical application of comparable analysis from a more theoretical angle. As a consequence, the answers to the relative weight scores and multiple deviations are hypothetical and reflect the VCs' general opinion.

The empirical basis of this research was an orally completed questionnaire. In general, questionnaire research has several unavoidable limitations. First, this study is vulnerable to self-selection bias because only the VCs that completed the questionnaire are included in the study's results. Second, this study suffered response accuracy issues as some VCs could not disclose the ARR multiples paid due to confidentiality reasons and some refrained from quantify the multiple deviations.

Furthermore, the reliability of the data on the relative importance of momentum, market, technology, management, and money could be compromised because me collected the data with a simplified multi-criteria decision-making method. Even though the reliability of the answers is less by using a more simplistic method, the author felt that by adopting advanced models such as the best-worst method by Rezaei (2015), response accuracy issues would arise. This is because these approaches do not have the option to assign all factors an equal weight score.

Additionally, VCs could only assign relative weight scores to the five predefined categories from the 5M-model. Consequently, the respondents did not have the room to assign a score to factors that do not fall under the five categories of the 5M model. Various VCs confirmed that they always take a look at the capitalisation table in the due diligence process. This table essentially breaks down the start-up's ownership structure. A few VCs mentioned that they will be more flexible in valuation negotiations if the capitalisation table contains reputable investors. Therefore, this will ultimately influence the multiple as well. This factor was not covered by any of these factors.

Lastly, the generalisability of the results is limited by the small sample size. Only 36 VC firms of the 250 of the estimated population participated. Despite contacting VC firms located all over Europe, the sample distribution is primarily heavy on Belgium and Dutch VC firms, compromising the results' generalisability to the European context. I undertook various efforts to include more respondents in the sample. However, due to the tight data collection time frame, no more respondents could be interviewed in time. Ultimately, the small number of observations has limited me from performing an extensive linear regression model, whereby I could not properly test hypotheses 5, 6, and 7.

6.1.3 Future research

Even though some limitations reduced the generalizability of this research, the results derived from the analysis were promising for future work on comparable analysis and valuation multiples in the VC context. First of all, a repetition of this study would be necessary to validate whether the current economic environment can explain the non-existing moderating effect of VC experience on deviations and valuation multiples. By systematically carrying out this type of research, academics can explore how the economic environment, the associated fund inflows, and competition between VCs impact VCs' valuation decision-making.

Furthermore, the analysis between VC firm experience and the valuation multiples paid should also be repeated using the European Investment Fund data. They have accumulated a large dataset of investments made by VC firms in which they are invested. As the data is collected at the investment level, the researcher will be able to perform VC firm firm-level regression analysis while controlling for investment-level characteristics.

Lastly, this study focuses only on software investments in Europe. As a result, this study can be repeated for different industries such as deeptech, healthtech, or cleantech. Subsequently, a comparison between the multiple deviations and the relative weight scores can be made. Additionally, this study can also be repeated with data from other geographies. This would make it possible to reveal cultural differences in the practical use of multiples based on comparables.

6.2 Conclusion

Valuing start-ups is a crucial part of the VC investment process as mistakes in fair value estimations have apparent consequences for all parties involved. Unsurprisingly, international accounting authorities strongly advocate for consistent valuation procedures in private markets worldwide (IPEV, 2018). As a result, VCs often use appraisal techniques from corporate finance literature. Academics show that comparable analysis is one of the most prevalent valuation appraisal techniques in VC today. However, VCs' practical application of this particular valuation approach is still shrouded in mystery. As a result, this study aims to better understand VCs' valuation procedure with comparable analysis and the relative importance of factors in determining the multiple. To answer this, 36 interviews with European software VCs were conducted in which the VC's approach to comparable analysis and the relative importance of five factors (momentum, market, technology, management, and money) were mapped out. In addition, I also explored whether VC firm experience is an explanatory factor for valuation behaviour linked to the perceived favourability of the five factors.

I concluded that VCs in the sample select transactions more frequently than quoted companies when composing a set of comparables. However, the information on comparable companies is highly fragmented. There is not one source from which VC retrieve all the necessary information. Most VCs rely on designated VC & M&A databases combined with internal databases, newspapers, online news outlets, research reports, and other VCs. The difficulty of finding private company information hampers the selection process significantly, whereby sets of comparables usually comprise less than ten comparables. In addition, it also forces VCs to stick with top-level selection criteria such as industry, business model, and product offering instead of more sophisticated financial and performance metrics. In half of the cases, theoretical multiples based on quoted companies are adjusted for liquidity differences between start-ups and publicly traded companies. On the other hand, multiples based on transactions are rarely adjusted.

The multiple used changes on a case-by-case basis. I find that all five factors matter for VCs when they determine the multiple. However, the management team matters just a little more. Momentum stands in second place, trailed by market and technology, which are almost equally value relevant. Money is the least important factor in the valuation decision of VCs. Therefore, founders should leverage management and momentum in valuation negotiations with investors to enforce a higher multiple as VCs tend to pay the largest premiums for these factors. Despite the market, technology, and management mostly being deal-breakers when perceived as unfavourable, VCs may use poor momentum and money to convince entrepreneurs that their requested valuation is not justified. Overall, I find no clear evidence that VC firm experience impacts the valuation behaviour for factors and the average ARR multiples paid. This is likely caused by the small sample size. However, I did discover that VC firms with more funds under management are willing to pay greater premiums for exquisite momentum.

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Appendix 1

List of respondents

No	Function	HQ location	Geographical investment focus	Investment stage
1	Partner	Germany	Europe	Seed
2	Analyst	The Netherlands	Benelux	Seed
3	Partner	The Netherlands	Europe	Seed, Early-stage
4	Partner	The Netherlands	Benelux, Dach, Nordics	Seed, Early-stage
5	Partner	The Netherlands	Europe	Early-stage, Late-stage
6	Investment Manager	The Netherlands	The Netherlands	Seed, Early-stage
7	Investment Manager	The Netherlands	The Netherlands	Seed, Early-stage
8	Partner	Belgium	Western Europe	Pre-Seed, Seed
9	Partner	Belgium	Europe	Seed, Late-stage
10	Partner	Belgium	Benelux	Pre-seed, Seed
11	Partner	Belgium	Europe	Seed, Early-stage
12	Investment Manager	The Netherlands	The Netherlands	Seed
13	Investment Manager	Belgium	Europe	Pre-seed, Seed, Early-stage
14	Investment Manager	Belgium	Belgium	Pre-seed, Seed, Early-stage
15	Investment Manager	The Netherlands	Europe	Early-stage, Late-stage
16	Investment Manager	The Netherlands	Europe	Pre-seed, Seed, Early-stage
17	Partner	Belgium	Europe	Pre-seed, Seed
18	Investment Manager	UK	Europe	Pre-seed, Seed, Early-stage, Late-stage
19	Investment Manager	Belgium	Europe	Seed, Early-stage

No	Function	HQ location	Geographical investment focus	Investment stage
20	Investment Manager	Belgium	Worldwide	Late-stage
21	Associate	Belgium	Benelux	Early-stage
22	Associate	UK	Europe	Early-stage
23	Partner	France	France, Spain, Portugal, UK	Seed, Early-stage
24	Partner	Portugal	Europe, USA	Pre-seed, Seed
25	Analyst	The Netherlands	Europe	Late-stage
26	Associate	The Netherlands	Europe	Late-stage
27	Partner	Estonia	Europe	Seed, Early-stage
28	Investment Manager	Spain	Europe	Seed
29	Partner	Sweden	Nordics, Baltics	Pre-seed, Seed
30	Associate	UK	Europe	Seed, Early-stage
31	Associate	Portugal	Portugal, Spain	Pre-seed, Seed, Early-stage
32	Partner	Portugal	Worldwide	Pre-seed, Seed
33	Partner	Netherlands	Netherlands, Germany, Nordics	Early-stage, Late-stage
34	Associate	Greece	Worldwide	Pre-seed, Seed
35	Associate	Greece	Europe, Latin America, Middle East	Seed
36	Partner	Belgium	Europe	Early-stage, Late-stage

Appendix 2

Interview motivation

The interviews are conducted with four objectives: (1) to facilitate the qualitative analysis of the selection process of comparables, (2) to collect quantitative data on the multiples being paid and the relative importance of valuation influencing factors, (3) increase the participation rate (Dittmann et al., 2004), and (4) to ensure that the questionnaire is completed by someone with extensive knowledge of the valuation practices (Dittmann et al., 2004). Besides, interviews have several advantages over other primary data collection approaches:

VCs consider parts of the valuation and investing procedure confidential. As a result, they can refuse to disclose information unless rapport is established between me and the respondent, the research goal is clearly communicated, and anonymity is guaranteed. One of the advantages of interviews is that it is possible to establish the necessary rapport (Sekaran & Bougie, 2019) to overcome potential trust barriers. This effect became apparent when several VCs indicated that, in normal circumstances, they would not answer the question on ARR multiples paid due to confidentiality reasons.

Secondly, the respondent was left with the option to could ask the interviewer to clarify specific questions (Sekaran & Bougie, 2019). This was particularly useful for the questions related to valuation methodologies because practitioners and academics do not necessarily use the same terminology. By clarifying these questions, the reliability of the data was improved. Furthermore, interviews allowed the interviewer to ask follow-up questions if an answer was deemed unclear (Sekaran & Bougie, 2019). This was particularly useful for the questions related to the selection process of comparables, as practitioners tended to give unstructured answers.

Lastly, the interviewer sporadically asked the respondents to elaborate on their answers to the closed-end questions. This ensured that the respondents' thought process for these questions was captured. As a result, the quantitative data and statistical findings be reinforced by a content analysis of the interview transcripts. This triangulation allowed me to increase the reliability of the study's findings.

Interview procedure

The interviews were conducted either in Dutch or English, depending on the interviewee's preference. The interview commenced with a brief introduction of myself, followed by an explanation of the study's objective, the data storage and analysis procedures, and assurance of anonymity. After that, topic-specific questions were asked in a logical order as described by Sekaran and Bougie (2019). Warm-up questions were followed up by more complex questions.

The interview's introduction served to introduce myself to the interviewee. In the first two minutes, my background was shortly discussed, followed by the motivation and eventual goal of this research. Subsequently, I clarified that the study relates to valuation decision-making, not investment selection. This is because the dynamics between the various factors are likely to be different in valuation than in investment selection.

I then asked several warm-up questions several warm-up questions to kick off the discussion. First, the interviewees were kindly invited to introduce themself and elaborate more on their professional background, the VC firm for which they worked, and their responsibilities within the firm. These warm-up questions were to verify that the respondent is involved in valuation

decision-making. Otherwise, the interviewee would not answer the more difficult questions accurately.

Subsequently, I asked the main interview questions to the interviewee. I decided to work with a predefined questionnaire to increase the reliability of the answers, limit the chance of interview effects, measurement errors, and increase the study's replicability. I presented the multiple-choice question and questions with a measurement scale through the screen sharing option of the video conferencing software. As a result, the answers were not ticked by the interviewer but by the interviewee to increase the validity and reliability of the data collected.

Appendix 3

Population estimation

Dealroom.co is a data platform for intelligence on start-ups, investors, and the global tech ecosystems that contains information on more than 123,000 investors worldwide. To subtract all European investors that engage in software deals, I make use of the advance filter function built into the platform. The refinement process consists of five consecutive steps.

The first refinement step aims to filter out all investors that are not identified as VC firms. The Dealroom.co investor database contains information on all types of investor classes such as angel investors, VCs, corporate investors, family offices, PE firms, and accelerators. Generally speaking, these investors join the investment process in different stages. For example, accelerators and angle investors mainly invest in pre-seed and seed stages, whereas VCs start investing from seed-stage onwards. Corporate investors, family offices, and PE firms predominantly target firms in more mature stages. The scope of this thesis is limited to VC firms only; therefore, the other types of investors are excluded from the data set.

Secondly, the research aims to get better insights into the inner workings of the European VC ecosystem. Therefore, the data set should only include VCs operationally active in the European start-up ecosystem. As a result, all VCs that are headquartered outside Europe are eliminated. In other words, US firms with European offices are erased as well. This is because these offices are in most cases led by managers who may act in accordance with the US procedures. Consequently, it may skew data on the inner workings of the European incumbent firms that are the focal point of this study.

Thirdly, VCs value a company to determine how much the company is worth as accurately as possible. They do this because they want to buy a "piece" of the company in return for funding. In other words, the ownership structure changes while the company remains the same as before the funding round. This is called an equity sale. Valuation plays a lesser important role in debt financing as the debt financier does not necessarily buy ownership of the company. Instead, they provide the start-up with money that has to be paid back over a specific time frame with interest. In venture financing, debt financiers can also invest through convertible notes. These are loans with which an investor expresses the intention of converting the loan's outstanding balance to equity after some time. In this case, debt financiers may have to apply valuation methods. However, convertible notes and the role of valuation methodologies in debt financing are outside the scope. As a result, all VCs that do not engage in equity investments are excluded from the data set. Afterwards, an industry experience filter is applied on the remaining 464 VCs to separate the VCs that take part in software deals from ones that focus on other verticals. As a result, BioTech, CleanTech, and hardware funds were removed from the data set, and the list was further reduced to 365 VCs.

Lastly, some VC firms are headquartered in Europe but solely invest in other geographies such as Asia and Africa. This would skew the data on the multiples being paid for software deals in the European ecosystem and are therefore excluded from the population. Additionally, the author assessed the remaining VCs if they are still operationally active by checking their websites. They were erased from the data set if they had no working website or showed no evidence of recent investments, they are erased from the data set. The final estimated population is 250 VCs based. Most of the VCs are headquartered in the UK, France, and Germany, trailed by The Netherlands, Belgium, and Spain. It is crucial to note that I do not use selection criteria for VC types. The

estimated population of 250 VCs consists of corporate VCs, government VCs, and independent VCs around Europe. This is deliberately done to get a holistic overview of the entire European software VC market.

1	All investors that were not identified as a VC in Dealroom.co were filtered out	21,000 Results
2	All VCs with HQs located outside Europe were excluded.	4,518 Results
3	All VCs that did not engage in equity investments, either minority or majority, were eliminated from the list. The reason being that this study focusses on the pricing of start-ups' shares, which is not necessarily required in non-equity deals.	464 Results
4	An industry experience filter was applied to separate the VCs with a software focus, with the ones that do not have any experience in this industry. The list was further refined to 365 VCs.	365 Results
5	The 365 VCs were subsequently assessed on a case-by-case basis to verify if (1) they have invested in the European start-up ecosystem and (2) are still operationally active.	250 Results

Appendix 4

Summary statistics of VC firms and funds

	N	%
Specialises on investment stage		
Only early stage (0 ≤ ARR < 1M)	12	33
Only late stage (1M ≤ ARR)	9	25
Both	15	42
Type of VC firm		
Generalist	21	58
Specialist	15	42
Type of fund		
Closed-ended	27	75
Open-ended	9	25
Focus area		
FinTech & InsurTech	26	72
Blockchain	12	33
AgTech	9	25
PropTech	17	47
AdTech	18	50
Consumer lifestyle	18	50
DeepTech	18	50
EdTech	18	50
Mobility Tech	14	39
Cyber Security	18	50
Sustainable Tech	17	47
HealthTech	15	42
Enterprise software	29	81
Number of offices		
Multi-office firms	14	39
Single-office firms	22	61
Total responses	**36**	**100**

Summary statistics of LP structure

	N	%
Limited partners		
Government Agency	18	50
Corporate strategic investors	7	19
Family offices / High net individuals	28	78
Fund of fund	18	50
Pension fund	7	19
Commercial banks	7	19
Insurance companies	2	6
Other	2	6
Biggest Limited partner		
Government Agency	13	36
Corporate strategic investors	0	0
Family offices / High net individuals	14	39
Fund of fund	1	3
Pension fund	0	0
Commercial banks	3	8
Insurance companies	1	3
Other	2	6
Total responses	36	100

Appendix 5

Percentage of VCs using a valuation methodology to value new software investments

Valuation methodology	Never	Seldom	Half of the time	Often	Always
Discounted cash flow	58%	19%	6%	14%	3%
Multiple based on comparable quoted companies	11%	19%	14%	25%	31%
Multiple based on comparable transactions	3%	19%	11%	39%	28%
Reverse engineering	14%	17%	6%	31%	33%
Recent transaction prices	38%	14%	14%	17%	17%
Real options	92%	8%	0%	0%	0%
Venture capital method	22%	6%	8%	39%	25%
First Chicago model	61%	6%	6%	19%	8%
Total responses	36	36	36	36	36

Preferred valuation methodologies by software VCs

	N	%
Discounted Cash Flow	1	3
Multiple based on comparable quoted companies	6	17
Multiple based in comparable transactions	8	22
Reverse engineering	10	28
Recent transaction prices	0	0
Real options	0	0
Venture capital method	3	8
First Chicago model	2	6
No preference	6	17
Total responses	36	100

Discounted cash flow

The popularity of the DCF method has declined significantly compared to 20 years ago. Only 3% of the sample's VCs asserted to use it always and 14% consider this approach often when determining valuations. 6% of the VCs report to make use of DCF half of the time, while 19% apply it seldomly. Most interestingly, 58% of the VCs surveyed emphasise to never ever consider this approach. Respondent 10 ironically mentioned that *"people in VC that use the discounted cash flow method should be fired."* Similarly, respondent 13 replied with: *"DCF, I have been working in VC for five years and have never used it to value a company."* Respondent 3 explained why DCF is not applicable in the world of VC because "*we look into companies that are cash flow*

negative and will remain cashflow negative for the next two years." Respondent 6 concurred with the statement of respondent 10 and added that *"this method is not suitable for high growth companies".* Despite the many arguments against the use of DCF in start-up valuation, one (3%) VC explicitly preferred the DCF methodology over the other methods.

Reverse engineering

Apart from comparable analysis approaches, reverse engineering is also a commonly adopted valuation models by European software VCs. This is because reverse engineering is an important sanity check as stated by respondent 6 and 22. It is in a VC's favour to avoid excessive dilution of the founders in a single funding round because it can hamper the start-up's chances of raising follow-on rounds. Respondent 1 asserted that *"it is just very normal [...] to be diluted for 15 to 25 percent. Everything above or below this range means something is odd."* Therefore, VCs will check whether their proposed valuation determined with other models will result in a 15-25% dilution of existing shareholders. Consequently, it is not surprising that 33% of the VCs always use reverse engineering and 31% often when determining a valuation. Ten (28%) mentioned reverse engineering as their model of preference.

Valuing start-ups is obviously a challenging task because of the limited financial information and the unpredictable growth prospects. The popularity of reverse engineering is attributed to the simplicity of the method according to several respondents. For example, respondent 11 said that *"It is very simple, especially in the early stages: founders want to sell x percent of the company for x million in capital. Either you accept it or you don't. Reverse engineering is the most common method."* In early investment stages, more complex methods *"will not yield reliable results"*, as stated by respondent 24. According to him, it is the primary reason why he always considers reverse engineering. However, 31% of the VCs report to apply reverse engineering seldomly or less. A finding that is quite remarkable if you consider the importance of founder dilution in funding rounds.

Recent transaction prices

Recent transaction prices are at least seldomly used by 62% of the sample's VCs. In contrast to other commonly used methods, the frequency percentages are fairly evenly distributed across all categories with a spike of 38% of VCs never considering recent transaction prices

Real options

The least used method is Real options pricing. Most VCs surveyed had never heard of this method before. For example, respondent 9 said: *"I am convinced that most of my colleagues won't be familiar with real options. We never us it."* Others that were familiar with this method referred to it as too complex or not reliable enough.

Venture capital method

Another prevalent valuation model in the European software VC ecosystem is the venture capital model, a methodology that shares some communalities with comparable analysis and the DCF approach. During the interviews, it became apparent that this model is in 25% of the cases always part of the set of approaches deployed when VCs determine a valuation. Despite 25% of the VCs reporting to always use the VC method in determining valuations, only 8% indicated it to be their preferred valuation model. 39% of the sample's VCs asserted to use it often. However, 22% never rely on the VC method. Several VCs emphasised that the VC method is a "sanity check" to assess if the desired rate of return can be achieved based on the (adjusted) company revenue forecasts.

First Chicago model

An even distribution for the VCs that use the first Chicago model, but the frequency percentages are considerably lower than for recent transaction prices. 61% of the VCs surveyed mentioned to never use the first Chicago model, whereas 8% of the sample's VC use it always and 19% often. 6% of the respondents mentioned to use it half of the time and seldom. Unsurprisingly, this method is mentioned by only 6% of the participants as the preferred methodology.

Appendix 6

Selection criteria

	Observations	Frequency
Sector	30	83%
Industry	10	28%
Industry vertical	20	56%
Market	6	17%
Geography	4	11%
Total addressable market (TAM)	3	8%
Start-up characteristics	26	72%
Business model	18	50%
Product offering	17	47%
Stage	3	8%
Team set-up	1	3%
Technology	1	3%
Performance metrics	5	14%
Cost of customer acquisition (CAC)	1	3%
Churn	1	3%
Employee efficiency	1	3%
Lifetime value of the customer (LTV)	2	6%
Net retention	1	3%
Rule of 40	1	3%
Financial metrics	7	19%
Growth rate	6	17%
Gross region premium	1	3%
Gross margin	4	11%
Revenue ratio (ARR/Total revenue)	1	3%

Notes: Categories are presented in the blue rows with the corresponding codes underneath. If the VC mentioned at least one code within the category, one observation was assigned to that category. As a result, the category frequency shows the percentage of VCs mentioning at least one code associated with that category.

Appendix 7

Information sources

	Observations	Frequency
VC & M&A Databases	18	47%
PitchBook	11	31%
CrunchBase	12	33%
Dealroom	5	14%
Merger Markets	3	8%
Preqin	1	3%
Publicly available databases on the internet	2	5%
Traxcn	1	3%
External Research Reports	10	28%
Advisor reports	2	6%
Benchmark reports	1	3%
Consulting reports	1	3%
Broker reports	3	8%
Delphi Digital	1	3%
Independent research institutes	3	8%
Private databases	8	22%
Evaluated deals	7	19%
Portfolio	1	3%
Websites & news outlets	10	28%
IntoTheBlock	1	3%
Newspapers	3	8%
TechCrunch	1	3%
Desktop research	7	19%
Public company filings	8	22%
Financial statements	3	8%
Indices	6	17%
Public Company Databases	6	17%
Capital IQ	5	14%
APIs	1	3%
Word-of-mouth	10	28%
Industry insiders	7	19%
Fellow VCs	3	8%

Notes: Categories are presented in the blue rows with the corresponding codes underneath. If the VC mentioned at least one code of the category, one observation was assigned to that category. The category frequency shows the percentage of VCs mentioning at least one code associated with that category.

Appendix 8

Percentage of VCs using a multiple type to value new software investments

Multiple bases	Never	Seldom	Half of the time	Often	Always
Revenue multiples	3%	3%	0%	17%	78%
EBITDA multiples	58%	17%	0%	11%	14%
EBIT multiples	78%	17%	0%	6%	0%
FCF multiples	92%	6%	0%	0%	3%
Employee multiples	89%	8%	0%	3%	0%
Customer multiples	75%	14%	3%	6%	3%
Other	89%	3%	0%	6%	3%
Total responses	36	36	36	36	36

Appendix 9

Differences between sub-samples // relative weights scores

	VC Type		Number of offices		Institutional LPs		DeepTech investments	
Factor	Generalist	Specialist	Single	Multi	No	Yes	No	Yes
Momentum	23.93 (6.45)	20.45 (7.52)	21.44 (7.79)	24.11 (5.51)	23.96 (8.63)	21.74 (6.161)	22.319 (6.75)	22.64 (7.50)
Market	19.05 (6.49)	21.48 (8.58)	21.13 (7.65)	18.39 (6.98)	18.13 (9.84)	21.03 (5.88)	19.99 (7.10)	20.14 (7.93)
Technology	17.74 (5.24	18.45 (6.18)	18.26 (5.99)	17.68 (5.04)	19.58 (7.82)	17.26 (4.02)	17.18 (5.27)	18.89 (5.89)
Management	26.07 (7.77)	28.58 (5.06)	26.65 (6.07)	27.86 (8.02)	25.21 (8.69)	28.07 (5.61)	28.26 (5.06)	25.97 (8.19)
Money	28.58 (6.38)	9.87 (3.79)	11.73 (6.02)	11.96 (5.21)	12.5 (6.22)	11.48 (5.44)	11.28 (4.52)	12.36 (6.67)

Notes: this table presents the relative weight scores of the 5 factors for each sub-sample and the corresponding standard deviation (between brackets)

Differences between sub-samples // ARR multiples paid

	VC Type		Number of offices		Institutional LPs		DeepTech investments	
Multiple	Generalist	Specialist	Single	Multi	No	Yes	No	Yes
Minimum	4.95 (2.37)	5.63 (3.14)	5.03 (2.76)	5.57 (2.71)	4.38 (1.50)	5.73 (3.12)	5.44 (3.22)	5.03 (2.09)
Average	8.86 (3.30)	10.40 (4.60)	8.68 (3.73)	10.79 (4.03)	8.71 (3.82)	10.00 (4.01)	10.14 (4.61)	8.88 (3.00)
Maximum	15.58 (9.69)	23.89 (24.07)	14.66 (7.45)	25.14 (24.64)	15.56 (12.93)	20.86 (19.40)	23.47 (22.59)	14.47 (7.94)

Notes: this table presents the ARR multiples paid for each sub-sample and the corresponding standard deviation (between brackets)

Appendix 10

The deviations from the theoretical multiple according to the favourability of factors (non-adjusted)

	Favourability			
Factor	Significantly below average	Below average	Above average	Significantly below average
Momentum	−66% (8%)	−42% (8%)	+14% (3%)	+41% (6%)
Market	−84% (5%)	−53% (6%)	+12% (2%)	+29% (4%)
Technology	−78% (6%)	−50% (7%)	+10% (2%)	+29% (4%)
Management	−92% (4%)	−58% (6%)	+18% (3%)	+57% (7%)
Money	−64% (7%)	−42% (7%)	+4% (1%)	+11% (2%)

Notes: This table presents the deviations from the theoretical multiples as a result of the perceived favourability of the factors and the corresponding standard errors (between brackets). The deviations for below average and significantly below average factors include the no-investment (−100%) answers.

The deviations from the theoretical multiple according to the favourability of factors (adjusted)

	Favourability			
Factor	Significantly below average	Below average	Above average	Significantly below average
Momentum	−28% (6%)	−21% (3%)	+14% (3%)	+41% (6%)
Market	−41% (8%)	−25% (4%)	+12% (2%)	+29% (4%)
Technology	−23% (3%)	−20% (4%)	+10% (2%)	+29% (4%)
Management	−39% (10%)	−27% (4%)	+18% (3%)	+57% (7%)
Money	−20% (5%)	−12% (3%)	+4% (1%)	+11% (2%)

Notes: This table presents the adjusted deviations from the theoretical multiples due to the perceived favourability of the factors and the corresponding standard errors (between brackets). The deviations for below average and significantly below average factors exclude the no-investment (−100%) answers.

Questionnaire

Section 1 – Respondent information	
Name	
Function	
Section 2 – Firm information	
Firm Name	
Founding Year	
HQ City & Country	
City & Country of Other Offices	
Total number of funds	
Section 3 – Information about most recent fund with software participations	
Fund Name	
Fund Number	
Founding year	
Limited Partners	☐ Government Agency ☐ Corporate strategic investors ☐ High net individuals / wealth offices ☐ Fund of fund ☐ Pension Funds ☐ Commercial Banks ☐
Largest LP	
Fund lifetime	
Fund size	
Minimum & maximum ticket size	
Geographical focus	
Number of existing portfolio companies	
Target number of portfolio companies	

Sector Focus	☐ Fintech & Insurtech ☐ Blockchain ☐ AgTech ☐ PropTech ☐ AdTech ☐ Consumer lifestyle (Food, Dating, Music, Gaming, Ecommerce) ☐ DeepTech (AR/VR, Big Data, AI) ☐ EdTech ☐ Mobility Tech ☐ Cybersecurity ☐ Sustainable Tech ☐ MedTech ☐ Enterprise software (CRM, HR tech, Productivity, ERP, Collaboration tools, SCM) ☐
Stage Focus	☐ Start-ups with ARR = 0 ☐ Start-ups with 0 < ARR < 1M ☐ Start-ups with 1M < ARR < 5M ☐ Start-ups with 5M < ARR

Section 4 – Valuation Methods					
Q1: How often do you use one of the following approaches when valuing start-ups?					
	0 never 0%	1 seldom 1–39%	2 half the time 40–60%	3 often 61–99%	4 always 100%
Discounted Cash Flow[1]	☐	☐	☐	☐	☐
Multiple based on quoted comparable companies[2]	☐	☐	☐	☐	☐
Multiple based on comparable transactions[3]	☐	☐	☐	☐	☐
Reverse engineering[4]	☐	☐	☐	☐	☐
Recent transaction prices[5]	☐	☐	☐	☐	☐
Real options pricing[6]	☐	☐	☐	☐	☐
Venture capital method[7]	☐	☐	☐	☐	☐
First Chicago model[8]	☐	☐	☐	☐	☐

Q2: On which valuation method do you rely the most upon?

Q3: For what type of start-up's do you use comparables in the valuation process?

Comment: only asked when the VC invests in multiple stages

- ☐ Start-ups with ARR = 0
- ☐ Start-ups with 0 < ARR < 1M
- ☐ Start-ups with 1M < ARR < 5M
- ☐ Start-ups with 5M < ARR

Definitions of valuation methodologies

[1] The value of a start-up is determined by discounting the free expected future cash flows.

[2] The value of a start-up is determined by selecting quoted comparable companies based on the start-up's business. The average multiple of comparable quoted companies is multiplied by the to-be valued start-up's metric (Sales, ARR, EBIT, EBITDA, etc.).

[3] The value of a start-up is determined by selecting relevant deals. Then, the average multiple that is paid in these transactions is multiplied by the to-be valued start-up's metric (Sales, ARR, EBIT, EBITDA, etc.).

[4] The value of a start-up is determined according to the financing requirements of the start-up and what percentage of equity the VC wants to receive in return. If a start-up has a funding need of 1M and the VC wants 20% of the equity in return, the implied post-money valuation is 5M

[5] The value of a start-up is determined by selecting similar deals and taking the average or median valuation of these deals as the valuation for the to-be valued start-up.

[6] The value of a start-up is determined by applying an option valuation model (Black-Scholes or binomial tree), analysing the whole company as a financial option.

[7] The start-up's value is determined by estimating the start-up's exit valuation (absolute value). This valuation is subsequently discounted by a required rate of return.

[8] The value of a start-up is determined by estimating the start-up's exit valuation (absolute value) for three cases (most likely, best, and worst). Valuations for each scenario are subsequently discounted by a required rate of return. Finally, a probability is assigned to each scenario. Consequently, the final valuation is equal to the sum of the probability times the valuation for each scenario.

If the VC uses multiples based on comparables **seldom** or **more**, the interview will continue. Whereas if multiples based on comparables are not used, the interview will be terminated.

Section 5 – Selection of comparables
Q1: How do you select comparables? Can you walk us through the process?
Q2: How many comparables (transactions or companies) do you select? Can you give us a range, and the mode (most usual number)?

Section 6 – EV determination of comparables
Q1: What sources do you use to find valuations of comparables? (e.g. database, stock market, etc.)

Section 7 – Multiple base determination					
Q1: What type of multiple do you use in the valuation process?					
	0 never 0%	1 seldom 1–39%	2 half the time 40–60%	3 often 61–99%	4 always 100%
ARR multiple	☐	☐	☐	☐	☐
Sales multiple	☐	☐	☐	☐	☐
EBITDA multiple	☐	☐	☐	☐	☐
EBIT multiple	☐	☐	☐	☐	☐
FCF multiple	☐	☐	☐	☐	☐
Employees multiple	☐	☐	☐	☐	☐
Customers multiple	☐	☐	☐	☐	☐
Other, please specify	☐	☐	☐	☐	☐

If the VC invests in **different stages**, the following questions will be answered for each stage unless the answers are identical.

Section 8 – Start-ups with ARR = 0

Only fill out this section if you have indicated in Section 4 Q3 that you use multiples for the valuation of start-ups with ARR = 0

Q1: Do you discount the multiple derived from quoted comparable companies or transactions for either (1) the illiquidity of the start-up's shares, (2) the differences in business size between the start-up and the comparables, or (3) to compensate for premiums paid in transactions? If yes, please specify and by how much?

Q2: What multiples have you paid for software start-ups in the past?

Type of multiple	Minimum	Average	Maximum

Q3: How important are the following factors relative to each other when considering the size of the multiple/valuation of the start-up?

Distribute a basket of **100 points** over the five factors according to their relative importance in valuing start-ups

Momentum	Market	Technology	Management	Money
R&D expenses, cash-on-hand, non-cash assets, revenue growth, customer adoption	market size, growth opportunities	intellectual property (IP), USP, scalability, defensibility of service/product	prior founding experience, personal network, operating experience, education of founders	funding need, previous valuations, desired equity stake, exit considerations, ROI

Q4: How much of a premium/discount on the multiple derived from comparables are you willing to pay in case of an (un)favourable factor?

Enter the premium/discount percentages in the grey boxes. Assume that a company that scores average is investible and valued with the average multiple mentioned in Section 8 Q2.

If you would not pay a premium/discount for the (un)favourable factor, please fill out 0%. If you would not invest in a start-up in the case of an unfavourable factor, please fill out -100%.

	Significantly below average	Below average	Above average	Significantly above average
Momentum R&D expenses, cash-on-hand, non-cash assets, revenue growth, customer adoption	%	%	%	%
Market market size, growth opportunities	%	%	%	%
Technology intellectual property (IP), USP, scalability, defensibility of service/product	%	%	%	%
Management prior founding experience, personal network, operating experience, education of founders	%	%	%	%
Money funding need, previous valuations, desired equity stake, exit considerations, ROI	%	%	%	%

Q5: When we refer to the money category, what do you consider as favourable here?			
Q6: Do the same answers apply to the other stages in which you invest?			
Start-up with 0 < ARR < 1M	☐ I do not invest in this stage	☐ Yes	☐ No, please fill out section 9
Start-up with 1M < ARR < 5M	☐ I do not invest in this stage	☐ Yes	☐ No, please fill out section 10
Start-up with 5M < ARR	☐ I do not invest in this stage	☐ Yes	☐ No, please fill out section 11

Section 9 – Start-ups with 0 > ARR > 1M

Only fill out this section if you have indicated in section 4 question 3 that you use multiples for the valuation of start-ups with 0 > ARR > 1M

Q1: Do you discount the multiple derived from quoted comparable companies or transactions to compensate for either (1) the illiquidity of the start-up's shares, (2) the differences in business size between the start-up and the comparables, or (3) for premiums paid in transactions? If yes, please specify and by how much?

Q2: What multiples have you paid for software start-ups in the past?

Type of multiple	Minimum	Average	Maximum
ARR			

Q3: How important are the following factors relative to each other when considering the size of the multiple/valuation of the start-up?

Distribute a basket of **100 points** over the five factors according to their relative importance in valuing start-ups

Momentum	Market	Technology	Management	Money
R&D expenses, cash-on-hand, non-cash assets, revenue growth, customer adoption	market size, growth opportunities	intellectual property (IP), USP, scalability, defensibility of service/product	prior founding experience, personal network, operating experience, education of founders	funding need, previous valuations, desired equity stake, exit considerations, ROI

Q4: How much of a premium/discount on the average ARR multiple (Section 9 Q2) are you willing to pay in case of an (un)favourable factor?

Enter the premium/discount percentages in the grey boxes. Assume that a company that scores average is investible and valued with the average multiple mentioned in Section 9 Q2.

If you would not pay a premium/discount for the (un)favourable factor, please fill out 0%. If you would not invest in a start-up in the case of an unfavourable factor, please fill out -100%.

	Significantly below average	Below average	Above average	Significantly above average
Momentum R&D expenses, cash-on-hand, non-cash assets, revenue growth, customer adoption	%	%	%	%
Market market size, growth opportunities	%	%	%	%
Technology intellectual property (IP), USP, scalability, defensibility of service/product	%	%	%	%
Management prior founding experience, personal network, operating experience, education of founders	%	%	%	%
Money funding need, previous valuations, desired equity stake, exit considerations, ROI	%	%	%	%

Q5: When we refer to the money category, what do you consider as favourable here?			
Do the same answers apply to the other stages in which you invest?			
Start-up with 1M < ARR < 5M	☐ I do not invest in this stage	☐ Yes	☐ No, please fill out section 10
Start-up with 5M < ARR	☐ I do not invest in this stage	☐ Yes	☐ No, please fill out section 11

Section 10 – Start-ups with 1M > ARR > 5M

Only fill out this section if you have indicated in section 4 question 3 that you use multiples for the valuation of start-ups with 1M > ARR > 5M

Q1: Do you discount the multiple derived from quoted comparable companies or transactions to compensate for (1) the illiquidity of the start-up's shares, (2) the differences in business size between the start-up and the comparables, or (3) for premiums paid in transactions? If yes, please specify and by how much?

Q2: What multiples have you paid for software start-ups in the past?

Type of multiple	Minimum	Average	Maximum
ARR			

Q3: How important are the following factors relative to each other when considering the size of the multiple/valuation of the start-up?

Distribute a basket of **100 points** over the five factors according to their relative importance in valuing start-ups

Momentum	Market	Technology	Management	Money
R&D expenses, cash-on-hand, non-cash assets, revenue growth, customer adoption	market size, growth opportunities	intellectual property (IP), USP, scalability, defensibility of service/product	prior founding experience, personal network, operating experience, education of founders	funding need, previous valuations, desired equity stake, exit considerations, ROI

Q4: How much of a premium/discount on the multiple derived from comparables are you willing to pay in case of an (un)favourable factor?

Enter the premium/discount percentages in the grey boxes. Assume that a company that scores average is investible and valued with the average multiple mentioned in Section 10 Q2.

If you would not pay a premium/discount for the (un)favourable factor, please fill out 0%. If you would not invest in a start-up due to an unfavourable factor, please fill out -100%.

	Significantly below average	Below average	Above average	Significantly above average
Momentum R&D expenses, cash-on-hand, non-cash assets, revenue growth, customer adoption	%	%	%	%
Market market size, growth opportunities	%	%	%	%
Technology intellectual property (IP), USP, scalability, defensibility of service/product	%	%	%	%
Management prior founding experience, personal network, operating experience, education of founders	%	%	%	%
Money funding need, previous valuations, desired equity stake, exit considerations, ROI	%	%	%	%

Q5: When we refer to the money category, what do you consider as favourable here?	
Q6: Do the same answers apply to the other stages in which you invest?	
Start-up with 5M < ARR	☐ I do not invest in this stage ☐ Yes ☐ No, please fill out section 11

Section 11 – Start-ups with 5M < ARR

Only fill out this section if you have indicated in section 4 question 3 that you use multiples for the valuation of start-ups with 5M < ARR

Q1: Do you discount the multiple derived from quoted comparable companies or transactions to compensate for (1) the illiquidity of the start-up's shares, (2) the differences in business size between the start-up and the comparables, or (3) for premiums paid in transactions? If yes, please specify and by how much?

Q2: What multiples have you paid for software start-ups in the past?

Type of multiple	Minimum	Average	Maximum
ARR			

Q3: How important are the following factors relative to each other when considering the size of the multiple/valuation of the start-up?

Distribute a basket of **100 points** over the five factors according to their relative importance in valuing start-ups

Momentum	Market	Technology	Management	Money
R&D expenses, cash-on-hand, non-cash assets, revenue growth, customer adoption	market size, growth opportunities	intellectual property (IP), USP, scalability, defensibility of service/product	prior founding experience, personal network, operating experience, education of founders	funding need, previous valuations, desired equity stake, exit considerations, ROI

Q4: How much of a premium/discount on the multiple derived from comparables are you willing to pay in case of an (un)favourable factor?

Enter the premium/discount percentages in the grey boxes. Assume that a company that scores average is investible and valued with the average multiple mentioned in Section 11 Q2.

If you would not pay a premium/discount for the (un)favourable factor, please fill out 0%. If you would not invest in a start-up in the case of an unfavourable factor, please fill out -100%.

	Significantly below average	Below average	Above average	Significantly above average
Momentum R&D expenses, cash-on-hand, non-cash assets, revenue growth, customer adoption	%	%	%	%
Market market size, growth opportunities	%	%	%	%
Technology intellectual property (IP), USP, scalability, defensibility of service/product	%	%	%	%
Management prior founding experience, personal network, operating experience, education of founders	%	%	%	%
Money funding need, previous valuations, desired equity stake, exit considerations, ROI	%	%	%	%

Q5: When we refer to the money category, what do you consider as favourable here?