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Determinants of Venture Capital Performance – Empirical Evidence

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**“What Georg Bernard Shaw said about love affairs is also apt for business: Any fool
can start one, it takes a genius to end one successfully”**

William D. Bygrave

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List of Abbreviations

BVCA	British Private Equity and Venture Capital Association
BVK	Bundesverband Deutscher Kapitalbeteiligungsgesellschaften
CA	Cambridge Associates
CVC	Corporate Venture Capital
DPI	Distributed to Paid in Capital
FOIA	Freedom of Information Act
GDP	Gross Domestic Product
GP	General Partner
HTGF	High-Tech Gründerfond
IPO	Initial Public Offering
IRR	Internal Rate of Return
KfW	Kreditanstalt für Wiederaufbau
LP	Limited Partner
M&A	Mergers & Acquisitions
MIRR	Modified Internal Rate of Return
NVCA	National Venture Capital Association
PME	Public Market Equivalent
R&D	Research & Development
RVPI	Residual Value to Paid in Capital
TVE	Thomson Venture Economics
TVPI	Total Value to Paid in Capital
US	United States of America
USD	US Dollar
VC	Venture Capital
VE	VentureXpert

1 Introduction

1.1 Motivation and Research Objectives

As an important source of financing for young entrepreneurial companies, often Venture Capital (VC) is a fundamental cornerstone in the raising of successful companies and entire industries. As a result, VC played an important role in many corporate success stories. Notably, VC helped to create some of the most important companies in today's business world, including Federal Express, Google, Genentech, and Apple.¹ This remarkable story seems to continue as venture capitalists form a crucial part of the financing processes of the latest generation of rising stars of the global corporate world like Facebook, LinkedIn, Zynga and Groupon.²

In Europe, the ongoing financial crisis dramatically reveals the importance of industrial competitiveness. In the face of ever increasing fiscal deficits, politicians as well as industrial leaders continue to praise innovation and its conversion into consumable products as an important factor to overcome economic crises. Thereto, existing academic literature proves that society benefits in multiple ways from VC investment activity. First of all, there seems to be an overall positive relationship between VC financing and corporate innovation.³ As it promotes the development of radical new technologies and disruptive business models, VC acts as a catalyst for far-reaching industrial and social change. Other studies find a growth increase of a country's gross domestic product (GDP) for a higher intensity of VC investment activity.⁴ Latest available data for North America by the NVCA⁵ shows that while VC investments represent merely 0.2% of US GDP, the revenue of companies created by the industry represented an impressive 21% of GDP in 2008.⁶ Associated academic research identifies a

¹ Cf. Sahlman (2010), p. 2.

² This list represents only a very limited abridgement of Initial Public Offerings (IPO) of VC-backed companies that took place throughout 2011 and 2012. The selection is based on the impressive size of the underlying valuation of these companies at the time of the public listing (in the range between USD 4 billion to USD 104 billion; all companies collected substantially more funds compared to Google in 2004) and based on the substantial media attention the public exits of these company attracted.

³ Cf. Kortum and Lerner (2000), pp. 674-692.

⁴ Cf. e.g. Meyer (2006), pp. 1-12.

⁵ The National Venture Capital Association (NVCA) is the leading trade association representing the VC industry in the US.

⁶ Cf. NVCA (2011), p. 1.

positive impact on employment growth and hence significant job creation activity.⁷ As a result, the deliberate promotion of VC activities is a crucial part of many national programs designed to stimulate research, innovation and technological performance.⁸

Independent of these identified positive impacts and prominent success stories, the VC industry looks back on a turbulent history. Ever since the inception of the modern VC era⁹, the yearly investment activity levels and thus the number of financed projects varied substantially. These swings in VC activity were primarily driven by changing industry prospects. Hence, scientific instrument manufacturers were of particular interest in the 1960s. The ascent of computer hardware companies (1980s), the boom of internet retailers and telecommunications companies (1990s), roaring investments into clean-tech¹⁰ companies at the beginning of the new millennium or the latest push into social media and cloud computing companies represent prominent investment periods.¹¹ Despite shifting industry focuses, the VC industry overall has grown substantially and became an important economic factor. According to inflation adjusted data from the Thomson Venture Economics (TVE)¹² database, the amount of VC investments in the US was about \$1.6 billion in 1980. By 1990, this figure had increased to approximately \$4.9 billion. During the internet bubble, this amount peaked at over \$120 billion at the end of the last century. After a sharp drop in the early years of the new millennium, the total amount of invested VC was around \$36 billion in 2010. Although the US is still the leading VC market with regard to total VC fundraising and investments, Europe and in particular Asia are becoming more and more important and already attract about half of the total investment flows.¹³

⁷ Cf. Belke, et al. (2003); Achleitner and Klöckner (2005).

⁸ Cf. Achleitner, et al. (2011); NVCA (2012a).

⁹ The foundation of the American Research and Development Company (ARD) by Harvard professor George Doriot in 1946 is frequently cited as the beginning of modern Venture Capitalism (see e.g. Weitnauer and Guth (2000); Haemmig (2003)).

¹⁰ To date, there is no clear respectively exact definition for the term “clean-tech”. According to the DCTI, the German CleanTech Institut, the term “clean-tech” is primarily “used to explain the concept that both efficiency and productivity can be increased by using new processes, products and services, while at the same time reducing greenhouse gas emissions and protecting natural resources”.

¹¹ Cf. e.g. Gompers, et al. (2008), p. 2.

¹² Thomson Venture Economics has developed its private equity research expertise by studying the industry for more than 20 years. With research methodology approved by the National Venture Capital Association, Thomson Venture Economics has more than 50 global researchers capturing daily deal flow events and verifying them with both companies and investors (Cf. Thomson (2004)).

¹³ Cf. Da Rin, et al. (2011), p. 3.

The increasing economic importance of VC goes along with a growing body of academic research on this topic. This is supported by typical characteristics of VC as an asset class which make it an interesting object of research and which delineate VC from traditional mutual fund investing. Thereby, it is decisive that venture capitalists almost exclusively invest in young, high-growth companies. As a result, VC investments are private by nature and therefore experience limited liquidity. Usually, these investments cannot be frequently sold but merely by means of complex divestment processes. Additionally, VC is characterized by the opportunity of the venture capitalist to add value throughout the investment period. Accordingly, venture capitalists are considered to be investors who contribute additional value generating services in excess of their cash investments.¹⁴ The joint provision of capital and non-financial support from a VC firm is occasionally called “smart money”.¹⁵

From the perspective of the venture capitalist and his investors, it is primarily the financial return that drives the ongoing attractiveness of this asset class. “Only, if [investors] accomplish sufficient financial returns on their investments, they will be successful in raising new funds for their future investment activity.”¹⁶ And herein is one of the key industry problems: recent industry data suggests that venture capitalists failed to return attractive returns to their own investors. According to the NVCA, US-based venture capitalists returned on average merely 3.6% over the five year period between 2007 and 2012 and 6.4% over the ten year period between 2002 and 2012.¹⁷ Consequently, less optimistic industry observers entertain substantial doubt on the overall “vitality” of this asset class and predict a potential, lasting reduction of capital funds allocated to the VC industry;¹⁸ a development which could ultimately have a severe impact on the financing alternatives which are provided to entrepreneurs.

Based on an extensive literature review and by means of own in-depth empirical analyses, this thesis strives to provide a comprehensive overview of determinants of VC investment returns. The knowledge on the fundamental drivers of successful VC investing is a prerequisite

¹⁴ Cf. Hellmann and Puri (2002), pp. 169-197; Baum and Silverman (2004), pp. 411-436; Busenitz, et al. (2004), pp. 787-807; Dimov and Shepherd (2005), pp. 1-21; Fitza, et al. (2009), pp. 387-404.

¹⁵ Cf. Fingerle (2005), p. 3; Sorensen (2007), p. 2725.

¹⁶ Kaplan and Schoar (2005), p. 1811.

¹⁷ Cf. Cambridge Associates (2012), p. 1; the data presents the performance of the Cambridge Associates LLC U.S. Venture Capital Index®. The index is based on data compiled from 1,368 US venture capital funds, including fully liquidated partnerships, formed between 1981 and 2012.

¹⁸ Cf. Kedrosky (2009), p. 287; Kaplan and Lerner (2010), p. 1; Lerner (2011), pp. 1-13.

to preserve VC as an attractive asset class. Consequently, in order to provide a holistic picture of the theoretical and empirical results, subordinated research objectives are addressed throughout the thesis. Accordingly, once the involved parties and relevant processes of the VC industry have been introduced, the analysis initially focuses on the presentation of the current academic knowledge on VC performance. After the current status quo of research dedicated to VC performance has been introduced and discussed, two own separate studies are presented, each of them dedicated to newly raised research objectives in the field of VC performance.

Objective #1: Literature overview and assessment of venture capital investment success factors

The first goal of this thesis is, hence, to present a focused overview on the comprehensive literature that has been published on the topic of VC performance in recent decades. Thereby, the objective is achieved through the discussion of two important aspects: *First*, the latest discussion on the relevant performance measures for the VC industry is presented. Although industry associations have introduced standards with regard to performance reporting, the current reporting activities by VC firms are frequently challenged by various stakeholders. Additionally, this debate is spurred by newest academic research focusing on existing drawbacks of the common reporting practice. *Secondly*, by means of an extensive literature review, relevant VC investment success factors, that have been identified, are introduced and discussed. Thereby, the analysis focuses on studies that explore the direct relationship between VC performance and the identified performance driver. To achieve this goal, the thesis starts with the development of a suitable framework to structure identified performance drivers. Subsequently, the theoretical as well as the empirical results are presented and discussed. Given the great variety of research that has been published a primary objective of this analysis is to be comprehensive enough to cover the current status quo of VC performance research, but on the other hand be lean enough to provide a pointed overview of the most relevant results. Ultimately, the review allows understanding to which extent single elements of the institutionalized VC process historically affected the performance of this asset class.

Building upon objective #1, own quantitative empirical analysis is subsequently introduced. For that purpose, the set-up for the own empirical procedure is initially introduced. Successively, two essays, each of which is a distinct research paper, are presented. Thereby, each essay addresses one of the following two objectives.

Objective #2: Assessment of the interdependence of market volatility and VC investment success

Within the wide spectrum of factors that have been identified to have an impact on VC investment success, limited academic research has been focused on the interdependence of the volatility on the VC supply as well as the demand side and the resulting impact of this interplay on VC investment success.¹⁹ The paper presented in chapter 4 contributes to this. Accordingly, the essay is focused on the question whether volatile VC investment returns are rather driven by fundamental changes with regard to the number of attractive investment opportunities (demand side of VC) or by overreaction by investors, namely venture capitalists and their investors (supply side of VC). Thereby, by means of own empirical analysis the thesis separately examines the impact of supply-related factors, i.e. money provided by VC investors, and demand-related factors, e.g. entrepreneurial activity, on the return of individual VC investments.

The study results promise to provide answers to different related questions. First of all, it will be interesting to observe which general impact suchlike volatility on the global VC markets has on the absolute and relative distribution of VC investment returns. Furthermore, the question of herd behavior within the VC industry is addressed, i.e. how independently individual venture capitalists allocate their funds into promising investment opportunities. Eventually, the study provides initial evidence on what impact systematic programs to enhance the entrepreneurial activity in a region or country would have on the VC ecosystem in general, and on VC investment returns in particular.

Objective #3: Assessment of VC performance potential from acquisition exits

A successful exit is the prerequisite for attractive returns. Venture capitalists can exit their portfolio companies in different ways. The company can be listed publicly by means of an IPO, it can be sold by means of an acquisition²⁰ or it can be dissolved by means of liquidation. Due to severe data limitations, existing literature to date focuses predominantly on the analysis of

¹⁹ Interestingly, a considerable amount of research deals with the standalone impact of VC supply on the investment performance. In this paper, however, we focus on the interplay between supply of and demand for VC in order to derive reasonable conclusion on their individual impact on investment performance. This way, above all the paper represent an empirical review of theoretical arguments provided by Lerner (2002a) on boom and bust cycles in the VC industry.

²⁰ Note: The terms acquisition and trade sale as an exit type are used interchangeably throughout this thesis. Both terms represent an exit event where the portfolio company of a venture capitalist is typically sold to a strategic buyer.

IPO exits.²¹ Building upon contemporary M&A literature, this thesis closes an existing research gap and investigates the returns to VC firms from acquisition exits. This is of particular interest in the current market climate, where distortions at the global capital markets and general investor uncertainty make public exits by means of IPOs hardly feasible. As a consequence, some scholars start to proclaim a new VC cycle which will enduringly be dominated by acquisition exits.²²

Focused on acquisition exits, the results of this study provide interesting evidence on various questions. First, the paper analyzes whether there are any superior divestment strategies from the perspective of the venture capitalist with regard to the potential buyer of the portfolio company. Secondly, it is researched whether any group of acquisition exits can be found that potentially achieves similar investment returns as IPO exits that are frequently cited as most promising.²³ Thereby, the analysis is finally focused on the identification of venture capitalist related characteristics that prove to be particularly suitable to maximize returns from acquisition exits.

The pursuance of these objectives, i.e. the results presented, is relevant from both an academic as well as practitioners perspective. From an *academic* point of view, the research presented in this thesis contributes in a number of ways to the knowledge in the arena of VC performance. Firstly, it seeks to consolidate results from existing research. Contingent on the perspective, there is substantial theoretical as well as empirical research on VC performance. Secondly, it seeks to close identified research gaps: Building upon a proprietary data set the thesis is capable to address research questions that have little respectively not at all been answered to date. Hence, the interplay between VC market fundamentals, the investment behavior of individual market participants and the resulting influence of VC investment performance has not yet been jointly analyzed. This thesis closes this gap by analyzing whether VC performance shows return patterns as predicted by fundamental changes on the relevant markets or whether returns are rather driven by (irrational) overreaction activity of market participants. Additionally, while there is extensive data and reliable research on the performance and fundamental performance drivers of public exits, i.e. by means of an IPO, as yet very little research has been carried out that focuses on the performance mechanics of acquisition exits. An empirical section

²¹ A notable exception is a study by Ball, et al. (2011) which analyses the relationship of market conditions and the decision to pursue an IPO or an acquisition exit.

²² Cf. Mendoza and Vermeulen (2011), pp. 1-37.

²³ See Brau, et al. (2003), Bienz and Leite (2008) or Cumming and Johan (2008a).

of this thesis is therefore dedicated to the in-depth analysis of return realization from this specific exit type.

In addition to these academic contributions, the thesis delivers helpful insights for practitioners and decision-makers within the VC ecosystem. Hence, for *entrepreneurs (and their companies)* the financial return that can be harvested from their entrepreneurial activity is an important goal respectively a key driver for personal motivation, along with simply being successful with the implementation of one's own business idea. Once the entrepreneur has received financing from venture capitalists, his personal success is often directly linked to the success of their investing venture capitalists.²⁴ Frequently, in order to minimize investment risk and in order to maximize potential investment proceeds, the investing venture capitalists implements contractual terms that closely ties the interest of the finance-seeking entrepreneur to the interest of the investor.²⁵ Any knowledge about transaction-related drivers of VC investment success is beneficiary for active entrepreneurs or people considering becoming an entrepreneur. Furthermore, the presented results of the analyses provide empirical guidance for active *venture capitalists*, i.e. general partners (GPs), to improve their investment performance. Albeit, future investment success needs to be assessed on a case by case level, the knowledge about historical investment success patterns can prove helpful to enhance future investment performance. The primary perspective applied, i.e. the analysis on transaction level, seems to be in particular suitable to derive conclusions with regard to single investment allocations. Resulting, the thesis strives to provide guidance to venture capitalists on optimal capital allocation decisions respectively to provide guidance on how to maximize returns from investments. The analyzed gross returns ultimately represent the basis for investment returns for *VC investors*, i.e. limited partners (LPs). Consequently, any investor that allocates funds into the VC industry has a natural interest in knowing relevant factors that drive the performance of their asset managers. Finally, due to positive economic impacts, the prosperity of VC as an asset class is of interest for *national governments and local politicians*. Accordingly, profound knowledge of most important drivers represents the basis for any political decision that aims at the improvement of VC investing.

²⁴ Cf. Hall and Woodward (2008), pp. 1163-1194.

²⁵ Cf. Hellmann (1998); Kaplan and Strömberg (2003); Cumming (2008).

1.2 Structure of the Thesis

The following structure is applied to achieve the introduced research purpose, i.e. to pursue the presented research objectives (*Chapter 1*).

Chapter 2 introduces the relevant concepts to understand VC as an asset class. Hence, fundamental characteristics of VC are successively introduced. For that purpose VC is at first delineated from other private equity related financing alternatives like buyout investments. Subsequently, the relevant characteristics of a typical VC firm are introduced.²⁶ Topics such as the sources of funds, the frequently adopted organizational structure as well as the compensation systems are discussed. Similarly, the relevant characteristics of a VC portfolio company are introduced. Building upon general investment considerations, i.e. VC investment strategies, the concept of different corporate development stages as well as the most important target industries are introduced. Finally, the comprehensive introduction to the VC investment process is a key part of the thesis. This is required as a profound knowledge about this complex process is essential for the subsequent analysis of VC performance and its fundamental drivers.

Chapter 3 consists of two different sections. The *first part* is dedicated to the introduction to and discussion of theoretical as well as practical fundamentals of performance measurement in the VC industry. Building upon chapter 2, performance is presented for three different perspectives: deal-level, fund-level and firm-level. Additionally, the concept of gross versus net returns is introduced and discussed with regard to the subsequent empirical analysis. In order to assess the current status quo of empirical VC performance evidence, the primary data sources that have been historically employed for empirical research are subsequently presented and discussed. The chapter closes with a comprehensive overview of historical VC returns. Starting from theoretical ex-ante return considerations, the relevant empirical literature is screened and the primary results presented.

The *second part* is a comprehensive analysis of VC performance drivers. By means of a systematic literature analysis the multitude of identified VC success factors is presented and

²⁶ The entire thesis focuses on the group of independent venture capitalists. Due to their focus on pure financial goals this type of investors differs from corporate venture capital or public venture capital (cf. Gompers and Lerner (2004), pp. 95-123). Note: Throughout this thesis, the usage of the masculine form of a venture capitalist is for convenience only, and refers to women and men alike.

discussed. For that purpose, the author initially develops a suitable framework to logically concatenate the various performance drivers. Accordingly, these drivers can be allocated into four areas that influence the ultimate investment success: (i) VC firm factors, (ii) portfolio company related factors, (iii) VC contracting related factors, as well as (iv) market related factors. Falling back on seminal academic publications, the relevant empirical results with regard to these factors are presented. Thereby, the analysis of the direct relationship between a single success factor and its impact on the actual return on investment is at the heart of the analysis. The chapter closes with a critical discussion of the presented results and the identification of prevailing research gaps.

The following chapters 4 and chapter 5 represent two distinct research papers. *Chapter 4* is dedicated to the second primary research objectives. Hence, the assessment of volatility of VC demand and supply and the impact of this instability on resulting investment returns is addressed. *Chapter 5* covers the analysis of VC returns from acquisition exits. In order to answer these research questions, these papers follow a stringent logic. First of all, the relevant theoretical considerations are presented and testable hypotheses are developed. Subsequently, the utilized proprietary data set is presented and discussed with regard to the general suitability for the conducted analysis. Thereafter, the relevant dependent, independent as well as control variables are introduced. Thereby, the focus is yet again on the discussion on the theoretical and empirical appropriateness of each of these variables. In the following, the proposed hypotheses are tested by means of relevant empirical methodologies. Statistical results are presented and the fundamental economic consequences discussed. To further challenge the robustness of the major findings, a comprehensive set of controls is utilized. Ultimately, potential pitfalls of the conducted analyses are discussed and avenues for future research presented.

The thesis closes with *chapter 6*. Here, the major results of the conducted analyses throughout the dissertation are summarized and discussed. Thereby, the focus is on the practical implications of the presented results. Limitations to the conducted research are subsequently addressed and critically reflected. The thesis closes with the provision of a future outlook for the VC industry and suggestions for future research in the area of VC performance.

Figure 1-1 provides a graphical overview of the structure of the thesis.

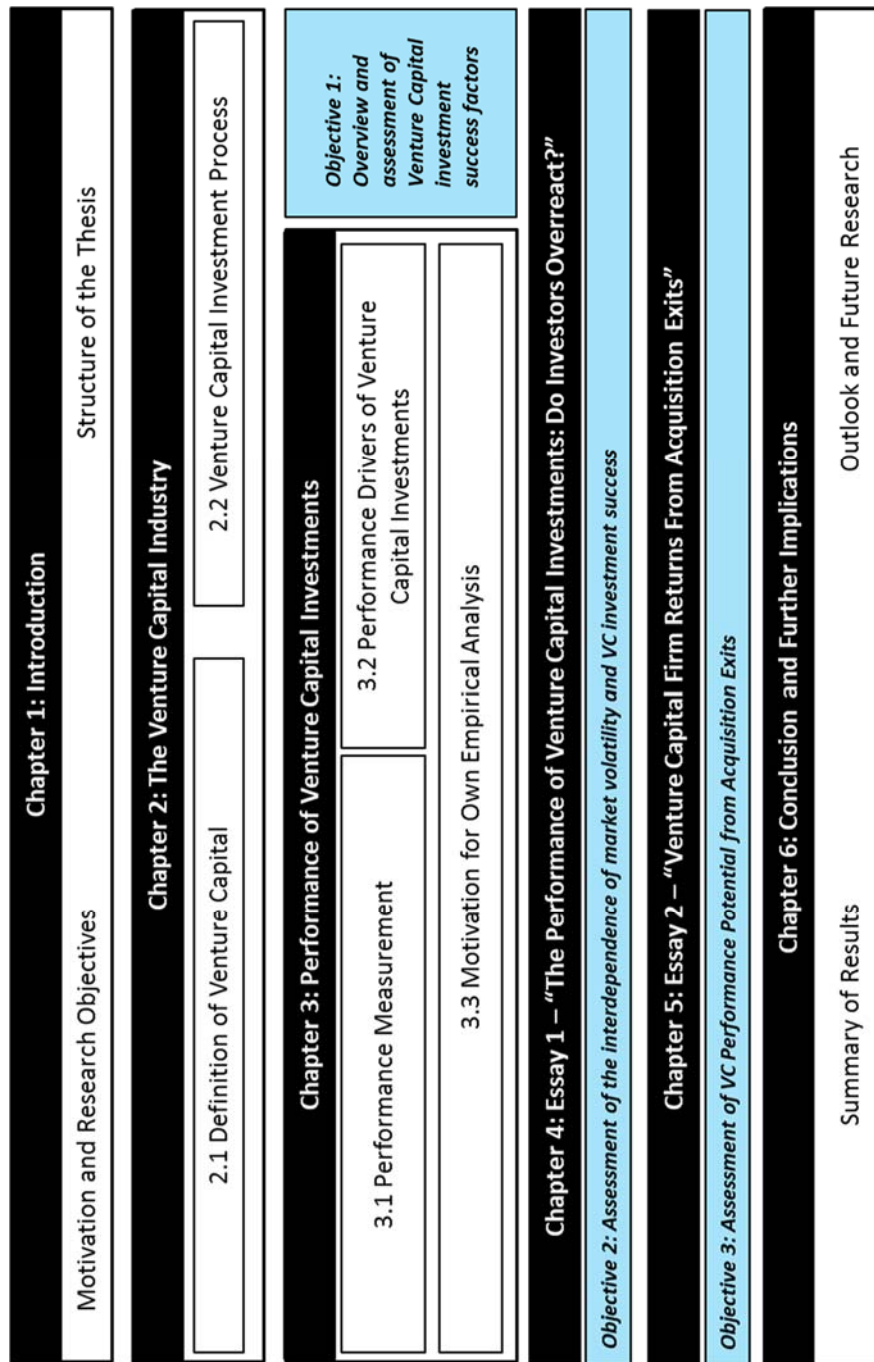


Figure 1-1: Structure of the Thesis²⁷

²⁷ Source: Own illustration.

2 The Venture Capital Industry

The comprehensive analysis of VC investment returns requires the understanding of the general VC investment process. Therefore, the relevant characteristics of the typical venture capitalist as well as the typical VC portfolio company are initially introduced. Subsequently, the regular VC business model is presented. Typical investment phases are outlined and discussed in detail. This knowledge is the prerequisite for the subsequent analysis of determinants of VC performance respectively investment success. Throughout this chapter, various empirical data is provided to support the presentation of VC fundamentals. In line with the geographical focus of the subsequent empirical analysis, descriptive statistics are primarily presented on a global scale (in particular for the US VC market).²⁸ On that point, it should be mentioned that despite the fact that regional particularities of VC markets can be observed, overall there seems to be a global convergence process ongoing which continues to eliminate major differences.²⁹

2.1 Definition of Venture Capital

As it is not consistently used in existing literature, first of all the term VC will be shortly delineated from related concepts. Often, US researchers use private equity (PE) as a general term which comprises VC and PE (narrow sense) as two major subcategories.³⁰ In contrast, European authors tend to employ VC and PE synonymously. Since the US definition is progressively used in the literature as well as by practitioners in Europe, this definition is consistently used throughout this dissertation.³¹ VC is the investment in companies at a relatively early stage of development, i.e. the provision of seed, start-up or growth capital. By contrast, buyouts comprise investments in more established companies with an extended corporate history. The following thesis exclusively deals with the VC part of the private equity industry. Accordingly, typical characteristics of private equity in the narrow sense, i.e. buyout transactions, are not further discussed.

²⁸ Whenever global data is unavailable, the author enriches this overview with data from a recent study on the German private equity market. This study was the outcome of a joint project conducted by the university department of the author and the economic department of Kreditanstalt für Wiederaufbau (KfW) in 2010. Additional details of this study can be found by Achleitner, et al. (2010).

²⁹ See Megginson (2004) for additional information on this convergence process.

³⁰ Cf. Bygrave, et al. (1999), p. 3; Lerner (2011), pp. 1-13; Metrick and Yasuda (2011), p. 2.

³¹ Cf. Kaserer, et al. (2007), pp. 13-14; Bender (2010), p. 11.

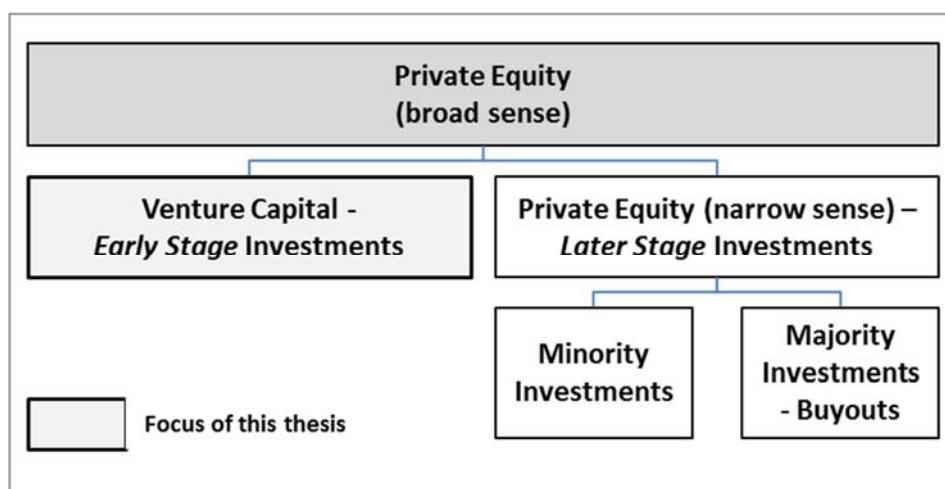


Figure 2-1: Private Equity as an Asset Class - Terminology³²

As financial investors venture capitalists are fundamentally comparable to other financial intermediaries. Accordingly, VC represents the “the professional asset management activity that invests funds raised from institutional investors, or wealthy individuals, into promising new ventures with a high growth potential.”³³ Nevertheless, VC is characterized by several distinctive features which clearly differentiate it from other financial products. Hence, in contrast to most other asset classes the work of venture capitalists does typically not end with the selection of interesting investment opportunities. As so called activist or “smart money” investors, venture capitalists take an active often even operational role to help their portfolio companies grow after the initial investment has been made.³⁴ Furthermore, the work of a venture capitalist is only completed once the portfolio company is successfully divested. Compared to other asset classes, this task is, however, often complicated by the fact that VC is almost exclusively invested into privately-held companies. As a result, at the end of the investment period VC participations cannot simply be traded on public exchanges.³⁵ The following sections further specify features that constitute VC as an asset class.

³² Source: Based on Kaserer, et al. (2007), p. 14.

³³ Da Rin, et al. (2011), p. 3.

³⁴ Cf. Fingerle (2005), p. 3; Sorensen (2007), p. 2725; Metrick and Yasuda (2011), p. 3.

³⁵ Cf. Metrick and Yasuda (2011), p. 3; The assumption that VC is fundamentally an illiquid asset class is commonly accepted. The own data set of several thousands of transactions shows an average holding period of 4.4

2.1.1 Characteristics of the Venture Capitalist

As financial intermediaries, venture capitalists raise capital primarily from institutional fund investors. As professional asset managers, institutional investors like insurance companies, pension funds or fund-of-funds allocate their assets over a broad set of different asset types (among others alternative asset classes like venture capital or private equity). Beyond that, venture capitalists collect money from investors like wealthy families or endowment funds who are evenly interested to be invested in VC as it promises potentially higher investment profits compared to regular asset classes like public equity or bonds.³⁶ Building upon successful investment track records (see chapter 3.2.2), VC firms attract these funds as they promise to achieve returns above the level of easily accessible asset classes like public equity or bonds. Thereby, the ability of a venture capitalist to deal with high levels of information asymmetries between their entrepreneurs and themselves as company investors is of crucial importance (see chapter 2.1.2).

Figure 2-2 illustrates the latest available statistic for the US private equity market. Accordingly, with a total fraction of 27% foundations are the largest contributors. With 21% endowments represent the second largest investor in private equity. Public and private pension funds as well as fund-of-funds investors follow. As they receive their funds from a diversified pool of investors, venture capitalists differentiate themselves from so called angel investors that exclusively use their own capital.³⁷

years. Recently, this concept has, however, been challenged by the emergence of private capital market places like SharesPost or SecondMarket. The market infrastructure of these companies allows sophisticated investors to buy and sell shares from not yet publicly traded companies. Although, these market places to date have only been accessible to a very limited amount of most promising ventures like Facebook or Twitter, it will be interesting to observe whether this development will have a perceptible impact on the existing VC investment model. First information on this interesting topic can be found by Mendoza and Vermeulen (2011).

³⁶ Cf. Bender (2010), p. 12.

³⁷ Cf. Harrison and Mason (2000), p. 95; Metrick and Yasuda (2011), pp. 3; Although funding from angel investors (often named informal VC) becomes increasingly important, more professional and is substantially larger than the more institutionalized VC market, in terms of both the amounts invested in businesses at their start-up and early growth stage and the number of such deals made, the thesis exclusively focuses on formal VC. Accordingly, within this thesis the term VC industry applies to the formal VC market only. Additional information on informal VC is among others provided by Brettel, et al. (2000); Harrison and Mason (2008); Zu Knyphausen-Aufseß and Westphal (2008); Kerr, et al. (2011).

Definition of Venture Capital

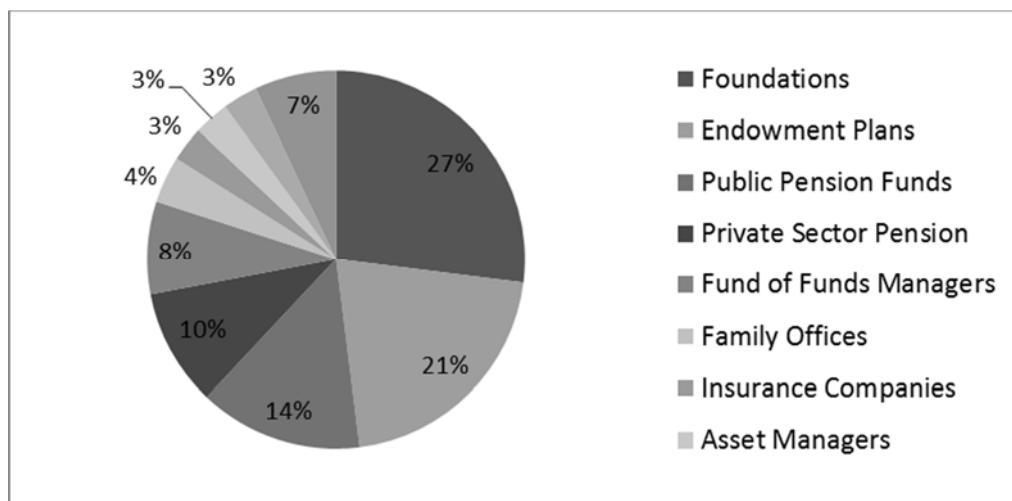


Figure 2-2: Make-up of Investors in US Private Equity³⁸

In contrary to popular belief, TIMMONS AND BYGRAVE assess the VC industry not to be an agglomeration of homogeneous firms, but rather a diverse group of investors that substantially differ with regard to objectives, strategies, resources, locations or organizational forms.³⁹ From an organizational perspective, international VC literature typically differentiates among two general types of VC firms: *independent VC funds* and *corporate VC funds*.⁴⁰ According to data provided by TVE (Figure 2-3), with a market share of approximately 85% independent VC funds represent by far the largest part of the US VC market. Independent funds are usually backed by many different investors and are by definition organizationally not linked to any of their capital providers. By contrast, corporate VC funds are typically controlled by an industrial company.

Whereas the vast majority of VC firms only pursue financial goals, corporate VC funds usually pursue both financial as well as strategic goals.⁴¹ Examples for strategic goals are access to new technologies, often called “window on technology”⁴², exploitation of complementary

³⁸ Source: Based on PREQIN (2012), p. 8.

³⁹ Cf. Timmons and Bygrave (1986), p. 163.

⁴⁰ Besides independent and corporate venture capitalists, governmental venture capitalists are sometimes named as a third group of investors (see among others Leleux and Surlemont (2003), Lerner (1999), Armour and Cumming (2006)).

⁴¹ Cf. Winters and Murfin (1988), p. 210; Chesbrough (2000), p. 5; Dushnitsky and Lenox (2006), p. 756; Hill and Birkinshaw (2008), pp. 423-424.

⁴² Cf. Ernst, et al. (2005), p. 235; Dushnitsky and Lenox (2006), p. 754; Neubecker (2006), p. 66; Benson and Ziedonis (2009), p. 329.

Definition of Venture Capital

resources⁴³ as well as the access to strategic options like the potential acquisition of an interesting M&A candidate⁴⁴. In addition, GOMPERS AND LERNER identify substantial differences with regards to organizational and incentive structures among these two types of VC firms. Hence, most corporate VC funds are structured as corporate subsidiaries and have much lower incentive-based compensation. In this regard, corporate VC is more considered to be a type of external R&D or to be a facilitator for corporate restructuring and strategy. Overall, this leads to lower profit orientation of this type of venture capitalist compared to venture capitalists with exclusively financial objectives.⁴⁵ As a result, corporate funds differ dramatically from both independent venture organizations and funds associated with commercial and investment banks.⁴⁶ Considering these differences and due to the nature of the own database⁴⁷, the focus of this thesis is on independent VC funds only.

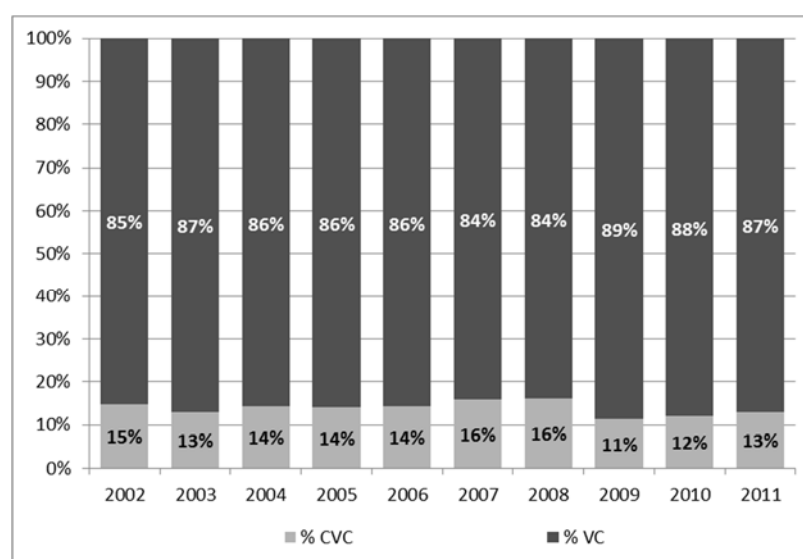


Figure 2-3: Independent versus Corporate Venture Capital⁴⁸

⁴³ Cf. Neubecker (2006), pp. 68; Allen and Hevert (2007), p. 266.

⁴⁴ Cf. Miles and Covin (2002), p. 34; Freese (2006), p. 23; Napp, et al. (2009), p. 1842.

⁴⁵ Cf. Chesbrough (2002), pp. 4-11; Bender (2010), p. 17.

⁴⁶ Cf. Gompers and Lerner (2000a); If a VC fund is fully controlled by a financial institution, one also speaks of a so called captive fund. In line with the argumentation of GOMPERS AND LERNER these captive funds are treated as independent funds within this thesis as many bank-affiliated funds retain the autonomous partnership structure employed by independent venture organizations.

⁴⁷ See chapters 4 and 5.

⁴⁸ Source: Based on Thomson Reuters data provided by the MoneyTree Report by PricewaterhouseCoopers and the National Venture Capital Association (NVCA) found at www.pwcmoneytree.com.

Definition of Venture Capital

With regard to its economic structure, according to COYLE wholly independent VC funds can be set up in two different ways:⁴⁹

- A group of experienced venture capitalists receives financial backing from several investment institutions that put money into a fund which is subsequently managed on the behalf of the venture capitalists.
- A group of financial institutions agree to set up a fund, and recruit a management team to make the investments. The fund managers then decide how to invest in business ventures.

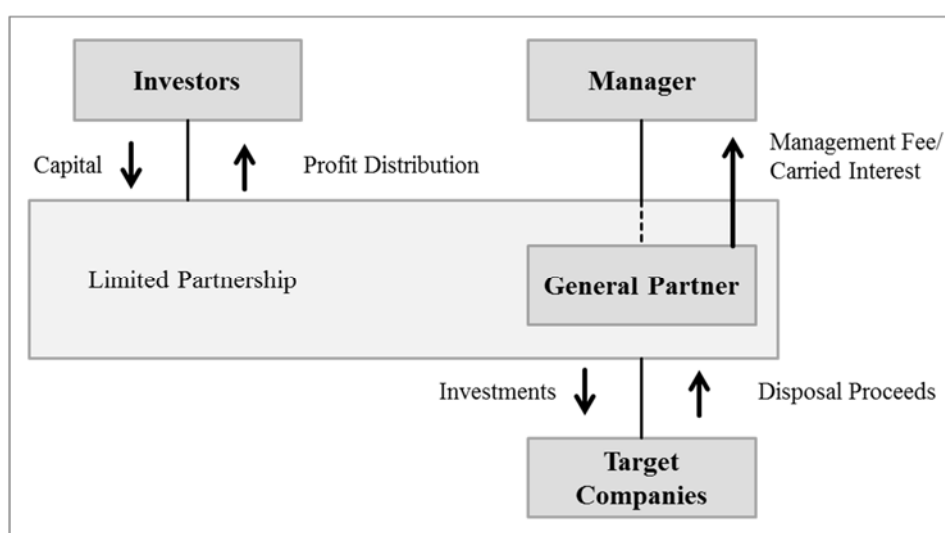


Figure 2-4: Venture Capital Fund Structure⁵⁰

Thereby, the most prevailing VC fund structure is traditionally a *limited partnership*, with the fund managers acting as GPs and the outside investors as LPs.⁵¹ Hence, according to this structure, a VC firm consists of a management company and one or more investment funds.⁵² Thereby, a *limited partnership agreement* constitutes all relevant rights and duties between GPs and LPs. This organizational form has been adapted from the oil wildcat drilling business of

⁴⁹ Cf. Coyle (2000), p. 15.

⁵⁰ Source: Based on data provided by the British Private Equity and Venture Capital Association (BVCA); BVCA (2002), p. 4.

⁵¹ Cf. Sahlman (1990), pp. 473; Achleitner and Müller (2004), p. 13.

⁵² Cf. Fenn, et al. (1995), p. 416; Fingerle (2005), p. 57.

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the late 1950s and is the predominant structure in today's institutional VC market.⁵³ Most recently available data from GOMPERS AND LERNER reveals that more than 80% of the capital committed to venture funds went to limited partnerships by the late 1990s.⁵⁴ Figure 2-4 illustrates a typical VC fund structure.

Accordingly, the GP is responsible for the operational management of the investment fund. The way the venture capitalist exerts active management as the GP, he also carries unlimited liability in the case of a financial loss. In addition, the GPs usually invest personal assets in the investment fund. Typically, this capital commitment represents, however, merely 1% of the total fund volume, whereas the LPs provide the remaining 99% of the total committed capital of the fund.⁵⁵ The LPs, in contrast, carry only limited liability, i.e. they are only liable to the extent of their registered investment into the limited partnership. Furthermore, LPs typically do not interfere with the fund's regular business operations.⁵⁶

Fund investors are attracted by numerous arguments. BANCE names among other the following fundamental rationales for investing in VC. At first, it is argued that VC historically achieved attractive investment returns. Besides, the distinctive features of this asset class provide in particular institutional investors the opportunity to further diversify their investment portfolio and hence benefit from improved risk and volatility characteristics. Finally, VC allows its investors to allocate financial resources into young, often fast-growing companies which are typically not traded on public exchanges.⁵⁷ Apparently, in order to benefit from these advantageous, venture capitalists are assumed "to have special knowledge in deal selection, deal structuring, and the investment development (monitoring and support)."⁵⁸

Considering this organizational set-up, the compensation structure of a venture capitalist is designed in order to best align the incentives of the venture capitalist and his investors. To achieve this goal, the typical VC firm remuneration consists of two different components: the

⁵³Cf. Hsu and Kenney (2005), p. 605.

⁵⁴ Cf. Gompers and Lerner (1999), p. 6; the main arguments for a limited partnership as an organizational structure are based on tax and legal considerations. As these kinds of issues are of little relevance for the conducted analysis VC performance determinants, they are not discussed in detail here. For the interested reader, SAHLMAN provides further information (Sahlman (1990), pp. 489).

⁵⁵ Cf. Hagenmüller (2004), p. 19; Fingerle (2005); Metrick and Yasuda (2010a), p. 58.

⁵⁶ Cf. Gompers and Lerner (1999), p. 6.

⁵⁷ Cf. Bance (2004), pp. 5-7

⁵⁸ Bender (2010), p. 12.

Definition of Venture Capital

management fee and the *carried interest*. The management fee serves to cover the running cost basis of the fund as well as the basic remuneration of the VC managers. Historically, venture capitalists initially receive on average 2% of the committed capital as a management fee.⁵⁹ However, according to recent data from METRICK AND YASUDA 42.6% of VC funds switch the calculation basis of these 2% from capital committed to invested capital beyond the investment period of five years. This structure is chosen to motivate the venture capitalist to bring the committed capital timely “at work”. Moreover, 55% of VC funds lower the percentage fee level beyond this period. A total of 16% of all VC funds accede to both of these measures. The carried interest normally represents 20% of the realized investment profits.⁶⁰ The reference parameter, thereby, is typically the total investment return (over all investments made) of the fund and not the respective return on single investments.⁶¹ This is common practice in order to limit the absolute amount of carried interest and (more importantly) better align the interests between GPs and LPs as the GPs is detained to focus on successful investments only.⁶² Finally, a *hurdle rate* is introduced in order to guarantee a minimum return to the fund investors. According to data from METRICK AND YASUDA, approximately 45% of VC funds operate with a hurdle rate.⁶³ As a result, the GP benefits from the carried interest only once a minimum return (usually 8%) is achieved and the LPs have at least been repaid their initial investment amount.

The typical *lifetime* of a VC fund is 10 years. During this ten year tenure, GPs make the selection of portfolio companies, provide value added services, and ultimately exit from the companies.⁶⁴ This way, the fund lifetime is split into two different periods: the *investment and divestment period*. The investment period represents the first three to seven years.⁶⁵ During this time the GP draws down the committed capital as funds are needed to make investments or to

⁵⁹ Cf. Gompers and Lerner (1999), p. 6; Kaserer, et al. (2007), p. 17; Metrick and Yasuda (2010a), p. 2310.

⁶⁰ Feinendegen, et al. (2003), p. 1170; Metrick and Yasuda (2010a), p. 2310-2311; The exact origin of the 20% focal point is unknown. “Existing literature points to Venetian merchants in the Middle Ages, speculative sea voyages in the age of exploration, and even the book of Genesis as sources” (Metrick and Yasuda (2010b).

⁶¹ Cf. Litvak (2004), pp. 175-177.

⁶² Cf. Hagenmüller (2004), p. 20.

⁶³ Cf. Metrick and Yasuda (2010a), p. 2311.

⁶⁴ Cf. Da Rin, et al. (2011), p. 4.

⁶⁵ Based on precise cash flow data for a large data set of private equity funds raised over the period 1981 to 2001, LJUNGVIST AND RICHARDSON find that it takes approximately six years for 90% of the committed capital to be invested (Ljungqvist and Richardson (2003), pp. 2).

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pay costs, expenses or management charges.⁶⁶ During the ensuing period, the investments are divested, or dependent on the investment success, liquidated. Thereby, it is important to note that VC funds are typically set-up as closed-end funds, i.e. the fund is self-liquidating as the underlying investments are realized.⁶⁷ As a result, at the end of the fund lifetime, the fund is legally and economically dissolved and all remaining assets are transferred to the investors. Hence, in closed-end funds, investors are usually opposed to the reinvestment of capital.⁶⁸

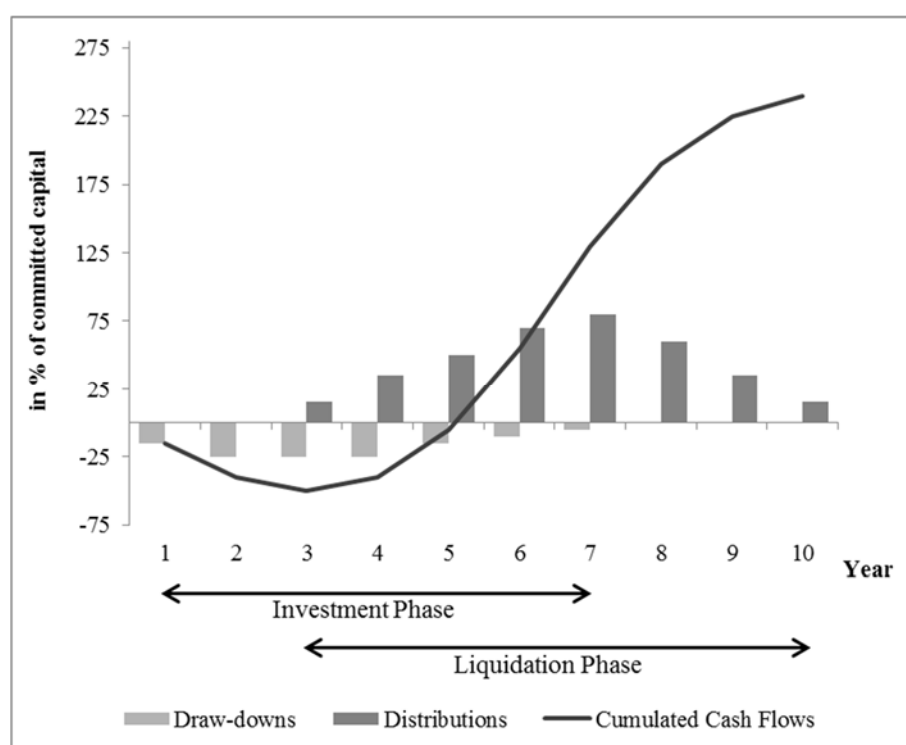


Figure 2-5: Typical Structure of Cash-Flows to Investors⁶⁹

Figure 2-5 summarizes the cash flow schedule that goes along with the typical investment activity of a VC fund. This type of cash-flow scheme is commonly assessed as so called J-Curve: “This term illustrates the tendency of VC funds to deliver negative returns and cash flows in the early years and investment gains and positive cash flows later in the investment

⁶⁶ Cf. Bygrave, et al. (1999), p. 81.

⁶⁷ Cf. Bygrave, et al. (1999), p. 81; in contrast to self-liquidating funds, some funds do not automatically distribute investment proceeds to their investors but instead reinvest them in further investments. These funds without a predetermined fund lifetime are called Evergreen funds. The number of existing Evergreen funds, however, is negligible small compared to the number of self-liquidating fund.

⁶⁸ Cf. Brooks (1999), p.111; Fingerle (2005), p. 68.

⁶⁹ Source: Based on Bance (2004), p. 9 and Hagemüller (2004), p. 22.

fund's life as the portfolio companies mature and are gradually exited".⁷⁰ The negative returns in early years are further pronounced due to scheduled management fee payments and the negative performance of early "lemon" investments.⁷¹ Although, the J-curve is a prevalent and widely accepted theory, recent research begins to challenge this concept, in particular in the VC context. Building upon proprietary data, MULCAHY ET AL. find no consistent evidence of a J-curve for venture capital returns since 1997. According to their data, a surprising number of funds show early positive returns that peak before or during fundraising for their next fund.⁷²

2.1.2 Characteristics of the Portfolio Company

Just like venture capitalists are characterized by specific characteristics, their portfolio companies share several common features as well. First of all, venture capitalists almost exclusively invest in companies whose shareholding rights are not yet traded on public exchanges, i.e. are privately held. As a result, venture capitalists face substantial illiquidity risk. Due to the limited amount of sophisticated investors and due to severe information restrictions, there are no active secondary markets which could be utilized to buy or sell VC participations.⁷³

Next to their private nature, several other distinct characteristics can be identified that make a private company a potential VC candidate. Thereby, two different perspectives are of importance: First, the portfolio company must itself be "in need" for VC, i.e. the company shows specific characteristics that makes the company receptive for VC financing. Secondly, the potential portfolio company needs to be an attractive target for venture capitalists, i.e. exhibits specific features that make the company an attractive investment case. To this regard NATHUSIUS names three major characteristics that make a company worthwhile for VC financing:⁷⁴

⁷⁰ Diller, et al. (2009).

⁷¹ Cf. Mulcahy, et al. (2012), pp. 26.

⁷² Cf. Mulcahy, et al. (2012), p. 8; looking at their proprietary portfolio data MULCAHY, WEEKS AND BRADLEY rather speak of an "n-curve", where the net portfolio internal rate of return (IRR) peaks in month sixteen (presumably driven by increases in company valuations, which the GPs themselves determine), and retreats precipitously over the remaining term of fund life.

⁷³ Cf. Ljungqvist and Richardson (2003), p.1; Metrick and Yasuda (2011), p. 2.; see footnote 35 for additional information on this topic.

⁷⁴ Cf. Nathusius (2005), pp. 13.

- 1) *Capital demand*: One fundamental prerequisite for VC funding is that the portfolio company exhibits a concrete financial need. Moreover, this capital requirement cannot be financed internally, i.e. by means of free cash flow generated through one's own operational activities. Finally, the potential VC candidate has usually no access to the general debt market or public equity market as an alternative source of financing.⁷⁵
- 2) *Non-capital demand*: In addition to financial requirements, a typical VC portfolio company is also interested in non-financial support. In the context of typical VC portfolio companies, FINGERLE identifies up to seven different types of resources that play an important role in the overall corporate development of portfolio companies (besides mere financial support) that can be provided or at least enhanced by venture capitalists.⁷⁶ Exemplary, this includes support in the recruiting of required key personnel or assistance in the process to protect corporate innovations by means of the efficient usage of intellectual property rights.
- 3) *High growth potential*: The potential to demonstrate high growth rates in the foreseeable future is another characteristic that is in particular important from the perspective of the venture capitalist. In a nutshell, high growth is a fundamental prerequisite in VC investing, as it enables the venture capitalist to achieve attractive returns at the end of the investment period. Thereby, the necessity for growth is subject to different considerations. First, in many business models – due to the nature of different operational and non-operational cost categories, i.e. the volume related behavior of fixed and variable costs⁷⁷ – revenue growth is essential in order to finally turn into a profitable company. Secondly, the valuation of the portfolio company (in particular at the time of the investment exit) is ultimately pivotal for the investment success of the venture capitalist. In today's investment practice, the achievable valuation is commonly closely linked to operational metrics like revenue, profitability

⁷⁵ Cf. Gifford (1997), pp. 459; Nathusius (2003), p.50.

⁷⁶ Cf. Fingerle (2005), pp. 26; FINGERLE takes a resource-centered perspective on companies which is although relevant to all firms in particular suitable for high potential companies. Taking this perspective he identifies eight different resources: 'technological resources', 'managerial resources', 'personnel resources', 'physical resources', 'organizational resources', 'reputational resources' or 'social resources'.

⁷⁷ This phenomenon is frequently paraphrased by the economic term "economies of scale", which refers to the reductions in cost per unit as the size of a facility and/ or the usage levels of other inputs increase(s).

(e.g. operational earnings) or net income.⁷⁸ Thereby, the growth potential of a portfolio company is typically assessed from two different angles. First, the overall addressable market opportunity, i.e. the total demand for the company's goods or services, needs to be sufficiently large to bear the potential for an interesting growth story. Secondly, often it is not necessarily the overall market potential that triggers an investment decision, but rather the potential development of the relative market share a portfolio company can achieve throughout the investment period.⁷⁹ Although, there is no representative data available, venture capitalists frequently name an overall revenue potential of at least USD 50-100 million as an important investment criteria.⁸⁰

As a consequence of this criteria catalogue, VC is (almost exclusively) invested into young, often technology related companies that offer high growth and value generation potential on the one hand but are subject to a high level of business risk on the other hand.⁸¹ Thereby, the young age⁸² of the portfolio company, combined with limited profitability in early years, limits the ability of the new venture to raise external capital. In the absence of a long corporate history, capital providers often lack the ability to diligently assess the sustainability of early business success. As a consequence of the remaining uncertainty, suchlike ventures have no access to financing alternatives like bank debt or public equity.⁸³ Besides, as a result of their young age portfolio companies typically lack professional experience and therefore are often in need of non-pecuniary resources as well.⁸⁴

⁷⁸ Achleitner and Nathusius (2004) provide a comprehensive overview of valuation methodologies that are typically used in the context of VC.

⁷⁹ Cf. Jarillo (1989), p. 135; Engel (2003), p. 62.

⁸⁰ Cf. Sahlman (1997), p. 101. Independent from the actual number, an important argument for such a magnitude is the substantial amount of expenses, i.e. transactions costs that are typically incurred in the process of an IPO.

⁸¹ Cf. Bender (2010), p. 15.

⁸² The characteristic of being young is not necessarily linked to the actual age of the company. Often the spin-off of business units of established companies represents an interesting case for VC. Nevertheless, the combination of interesting growth opportunities in sufficiently large market is a common characteristic of VC portfolio companies.

⁸³ Cf. Gifford (1997), p. 459; Söderblom and Wiklund (2006), p. 12.

⁸⁴ Cf. Cumming, et al. (2005b), p. 296; Bender (2010), p. 14.

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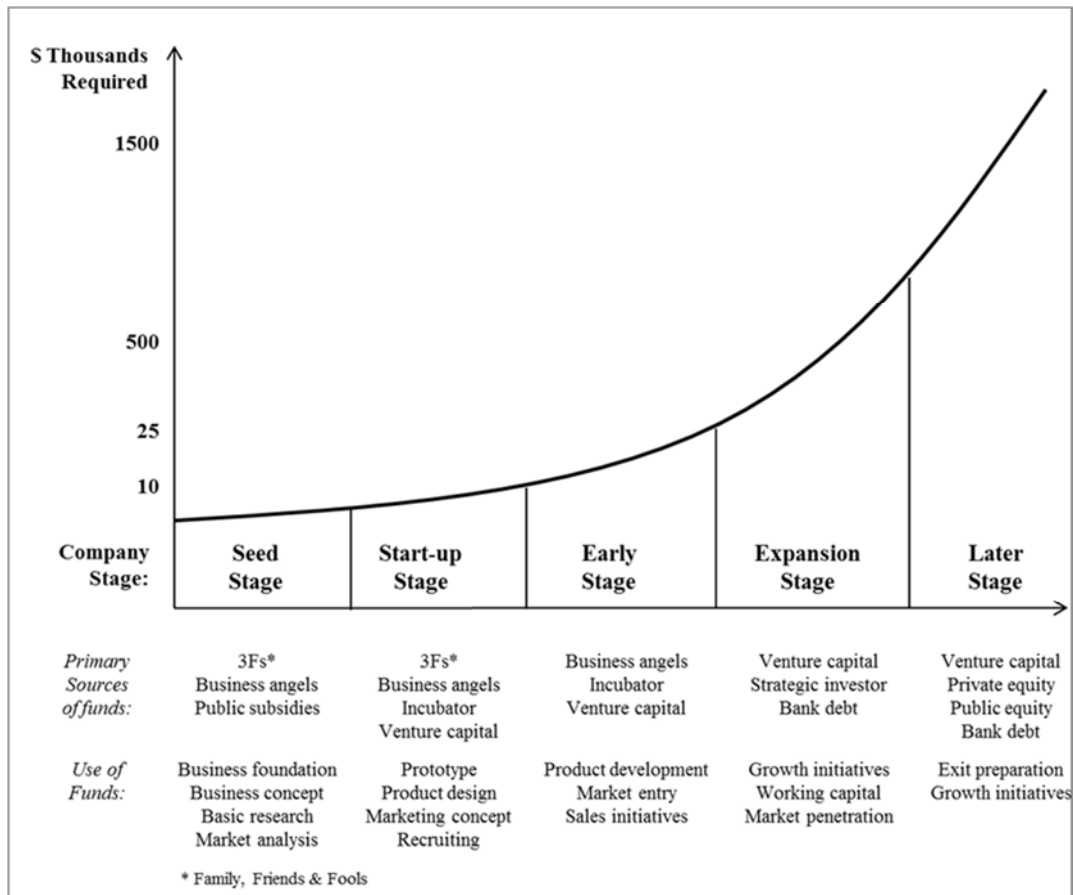


Figure 2-6: Venture Capital Financing Stages⁸⁵

Although, there is no consistent terminology used for single investment stages, there seems to be relative high agreement with regard to the level of development of the respective companies.⁸⁶ Throughout this paper the definition of corporate stages closely follows the classification as provided by TVE.⁸⁷ Figure 2-6 illustrates these typical development stages by showing the financial requirements as well as related sources and uses of funds for each corporate stage. Accordingly, *seed* stage financing is provided to portfolio companies that have not yet fully established commercial operations. Therefore, part of the entire financing is typically used for

⁸⁵ Own source based on Schefczyk (2000), p. 37; Askar (2008), p. 14.

⁸⁶ RUHNKA AND YOUNG are one of the first that systematically analyze the stages of development in the context of VC. Their study examines the perceptions of the CEO or managing partner of 73 US VC firms about key features of the development process for new businesses. Building upon their research, they develop a model that consists of five sequential stages: 1) “seed”, 2) “start-up”, 3) “second stage”, 4) “third stage” and 5) “exit stage” (Ruhnka and Young (1987), pp. 167-184).

⁸⁷ According to TVE the “investment focus of a fund can be classified as either seed stage/startup, development, early stage, balanced/diversified, expansion, later stage, mezzanine stage, buyouts, recap, turnaround/restructuring/special situations, distressed debt, generalist, other private equity/special situation, fund of funds, secondary funds, energy, real Estate, or timber” (Thomson (2012)).

further research and product development initiatives. Hence, according to TVE this stage “describes funds that make investments in newly formed companies thereby helping a company’s founders to develop and design a product or service.”⁸⁸ *Start-up* investing is the next stage of capital financing that is primarily provided to companies that are in the process of being set up or may have been in business for a short time only. Typically these ventures have not yet sold their product commercially.⁸⁹ Once a company successfully completes the seed/startup phase, *early* stage investors make contributions into portfolio companies in order to provide financing to increase manufacturing and sales capacity or for the set-up of first marketing campaigns. *Expansion* financing is according to TVE subsequently invested “into portfolio companies that have products and services that are currently available, and require additional capital to expand production to increase revenue.”⁹⁰ Hence, venture capitalists who are in particular focused on this expansion stage typically invest into companies with a proven business model only. As a consequence of this proven business model, the estimated risk of loss, i.e. the potential complete failure of an investment, drops significantly, once the portfolio company enters into this stage (see Figure 2-7). Nevertheless, the portfolio companies still require substantial liquidity in order to further expand their business activities with regard to production, shipment and increasing sales volume. Through the exploitation of economies of scale the portfolio company becomes finally more profitable or profitable after all. The *later* stage represents the “last round of investments in portfolio companies before an exit in the form of an IPO or acquisition by a strategic partner”.⁹¹ Accordingly, this stage is frequently quoted as prepublic-stage which represents an indication for an upcoming exit event.⁹²

⁸⁸ Thomson (2012)

⁸⁹ Cf. Bender (2010), p. 14.

⁹⁰ Thomson (2012)

⁹¹ Thomson (2012)

⁹² Cf. Ruhnka and Young (1987), p. 179.

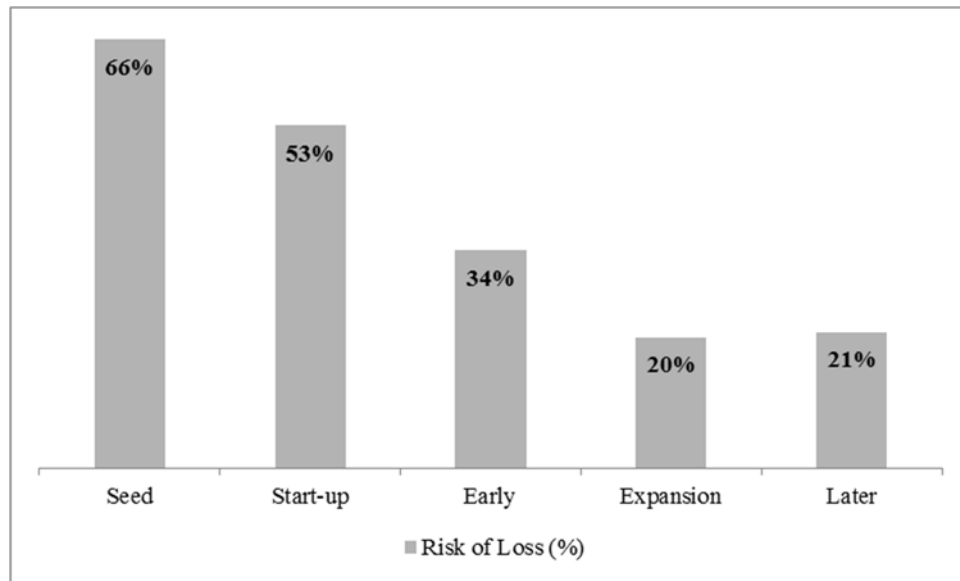


Figure 2-7: Percentage of Failed Investments by Stage⁹³

The high growth potential as well as the opportunity for the venture capitalist to generate value throughout the investment period are two important characteristics of “VC-ready” companies.⁹⁴ As a result, VC investments are typically focused on few technology-centered industries only. Thereby, looking at the history of the VC industry, the focus of fund flows frequently changes among different industries or is channeled into a sector that is still to be defined. This way, VC often acts as a catalyst for the advent of radical new technology or an entire industry. The growth potential of each industry at a specific point of time is thereof critical. Sometimes, the expected industry prospect is the relevant argument to invest in a particular industry. Once, a venture capitalist decides to invest into a specific industry, he subsequently screens the available company pool which allows him to participate at the industry trend. The growth potential of that particular industry is then utilized as a proxy for the venture’s growth potential.⁹⁵ To match the introduced investment prerequisites, venture capitalists usually engage in trend-setting and often technology intensive industries. The actual allocation of funds as shown in Figure 2-8 confirms this assessment. Data for US VC investments by industry sector for the year 2010 demonstrates a distinctive focus on technology.

⁹³ Based on Ruhnka and Young (1987), p. 180.

⁹⁴ Cf. Bender (2010), p. 15.

⁹⁵ Cf. Nathusius (2005), pp. 18-20; Bender (2010), p. 15.

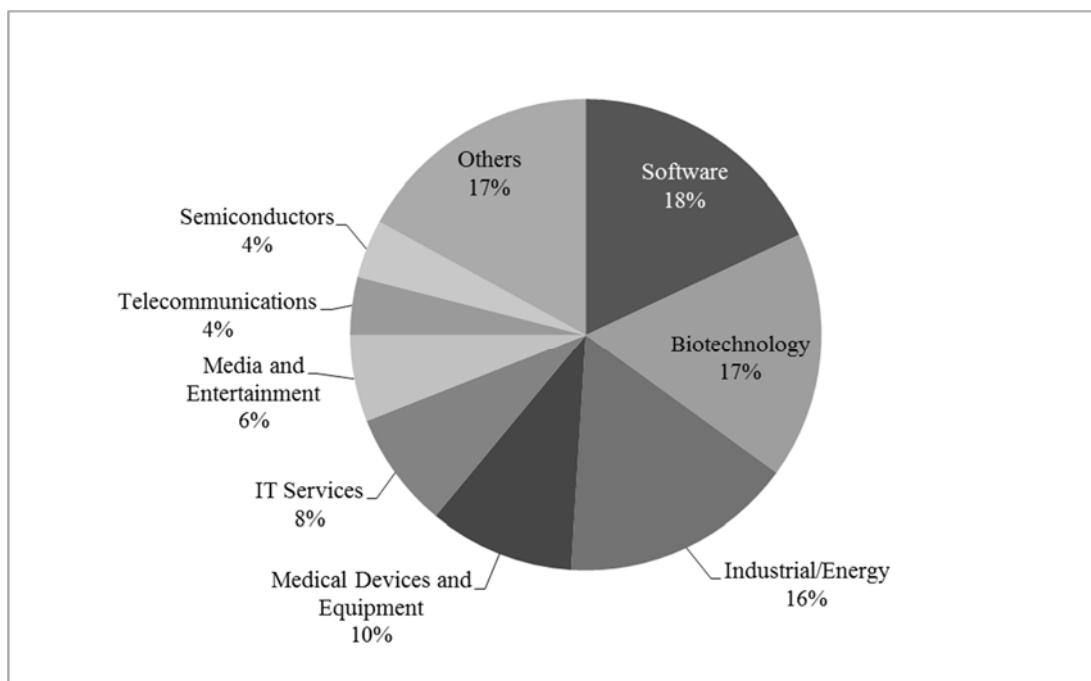


Figure 2-8: Venture Capital Investments by Industry⁹⁶

2.2 The Venture Capital Investment Process

The approach of an investor that not only diligently selects and monitors but even more importantly actively develops its portfolio companies is another defining character of the VC asset class.⁹⁷ These different activities represent the fundamental day-to-day business of a venture capitalist and constitute the typical VC business model which has first been introduced by WELLS and further specified by TYEBEE AND BRUNO.⁹⁸ Latest contributions outline five typical phases that define the typical VC investment process: Investment origination, investment selection, investment structuring, investment development and investment exit (Figure 2-9).⁹⁹

⁹⁶ Cf. NVCA (2011), p. 25.

⁹⁷ Cf. Metrick and Yasuda (2011), p. 3.

⁹⁸ Cf. Wells (1974); Tyebjee and Bruno (1984), pp. 1051-1066.

⁹⁹ Cf. Diller, et al. (2009), p. 523.

The Venture Capital Investment Process

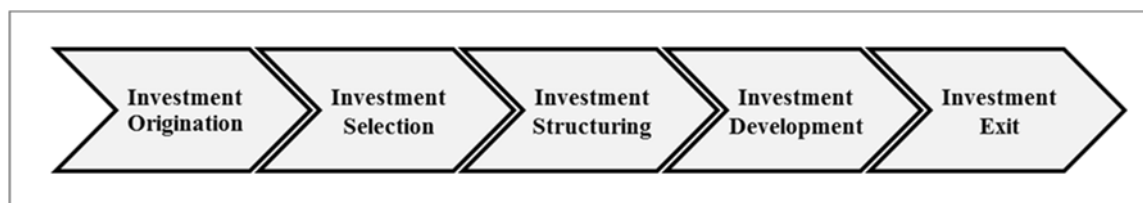


Figure 2-9: Venture Capital Investment Process¹⁰⁰

Hence, VC investing begins with the *investment origination* process which comprehends all activities that enable a VC to get to know a potential investment opportunity.¹⁰¹ The primary goal of this activity is, therefore, to generate a sustainable and attractive deal flow.¹⁰² Next to being sufficiently large in order to source from an attractive pool of different business ideas, the generated deal flow preferably matches early on the investment focus of the venture capitalist with regard to industry or corporate stages.¹⁰³ Resulting, a focused deal sourcing approach increases the overall efficiency of the subsequent investment process. With regard to deal origination, the contact to potential portfolio companies can either be established directly or indirectly. Direct search comprehends activities like participating in relevant VC summits or start-up presentation days as well as the marketing and public relation activities of the GP to increase the overall public awareness of the investment firm. TYEBEE AND BRUNO further mention deliberate scanning procedures as another alternative to identify potential investments.¹⁰⁴ By means of specific industry or technology scans, venture capitalists try to identify and subsequently contact the most promising candidates to participate in the future prospects of particular industries or technologies. Figure 2-10 summarizes the relevant deal sources for German early stage investors. Hence, most of the generated deal flow traces back to indirect sourcing activities like the frequent contact with other financial intermediaries. This includes among others supporting actors like industry consultants or corporate finance advisors. Finally, the origination through one's own proprietary contact network plays in particular an important role. In

¹⁰⁰ Based on Nathusius (2005), p. 30.

¹⁰¹ Cf. Tyebjee and Bruno (1984), p. 1052.

¹⁰² Deal-flow typically comprehends all investment opportunities that a VC firm has access to by means of various sources.

¹⁰³ Cf. Achleitner, et al. (2010), pp. 28.

¹⁰⁴ Cf. Tyebjee and Bruno (1984), p. 1053.

comparing various studies that analyze the origin of VC deal flow, BENDER concludes that approximately one third of the entire deal flow is received through the direct contact to entrepreneurial teams, whereas two thirds are established indirectly.¹⁰⁵

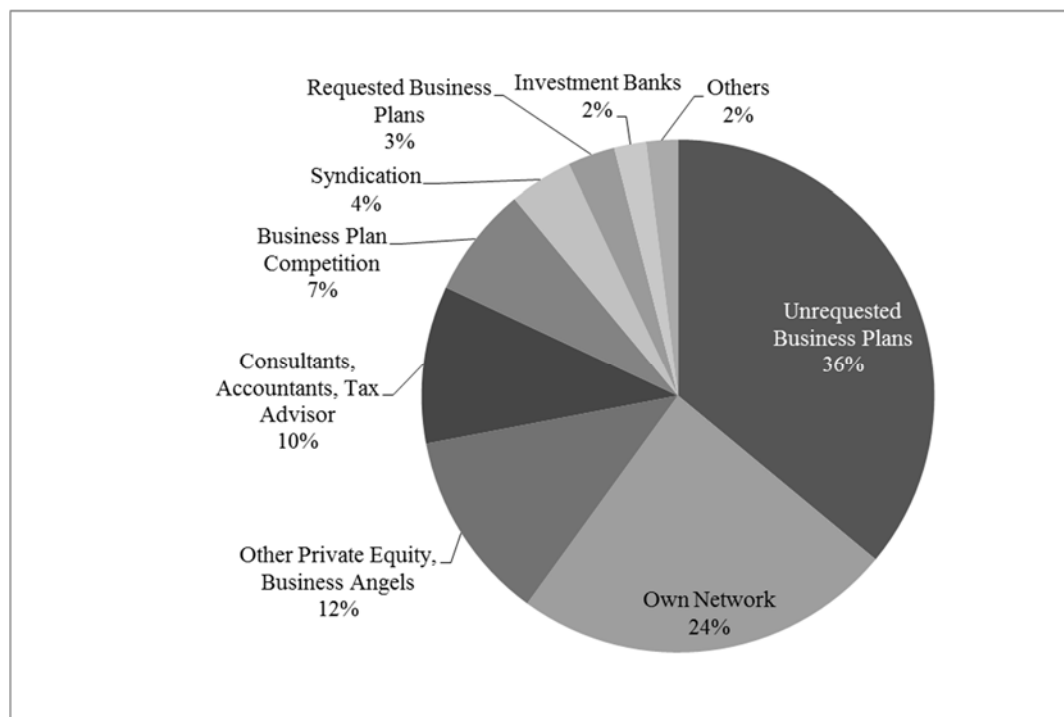


Figure 2-10: Venture Capital Deal Flow Sources¹⁰⁶

The *investment selection* process comprehends the entire process to narrow down the introduced deal flow to a reasonable amount of actual investments. Since venture capitalists have limited time and staff available, they establish structured procedures to select their portfolio companies and to allocate their committed capital. A recent study for the German private equity market finds that an independent VC firm employs on average 5 investment professionals that manage an average portfolio of 18 portfolio companies.¹⁰⁷ Accordingly, an investment professional is responsible for three to four investments. Similar data can be found for the US. According to data from the NVCA, a US VC firm employs on average 7 investment professionals who are responsible for approximately 4 to 5 portfolio companies.¹⁰⁸ Hence, investment professionals typically need to split their limited resources on deal selection activities on the one

¹⁰⁵ Cf. Bender (2010), pp. 24-25.

¹⁰⁶ Cf. Achleitner, et al. (2010), p. 28.

¹⁰⁷ Cf. Achleitner, et al. (2010), p. 12.

¹⁰⁸ Cf. NVCA (2012a), p. 9-11.

hand and monitoring activities on the other hand. To address consequently the requirement for an efficient procedure, the deal selection process is typically broken into two different steps, the deal screening activities and the deal due diligence activities.¹⁰⁹ Taking place in chronological order, both steps differ with regard to the level of intensity that a potential venture is evaluated as prospective portfolio company.

The *screening* process, which normally takes merely 15 minutes¹¹⁰, represents a first check whether the potential investment fits to the overall portfolio strategy. Thereby the screening process is typically influenced by the investment strategy of the venture capitalist. Hence, some investors focus on particular industries and technologies, while others engage only in specific corporate stages or geographies.¹¹¹ Primary purpose of this activity is therefore to disregard all investments that do not fit in the general investment strategy. Besides the requirement to match the general strategic focus of the VC firm, different selection strategies are applied with regard to restrictiveness of the potential portfolio company to fulfill required investment criteria. Hence, RIQUELME AND RICKARDS find that only two out of seven venture capitalists follow a so called non-compensatory rule within their screening process.¹¹² This rule means that a potential venture fails to be an attractive investment opportunity as soon as it fails to meet only one of the requested investment criteria.

Existing studies provide certain evidence that the specialization on specific investment characteristics improves the investment performance of venture capitalists.¹¹³ Often, the required financing volume represents another quantitative threshold which is typically closely related to the overall size of the VC fund.¹¹⁴ Relevant economic considerations by the venture capitalist are responsible for suchlike restrictions within the investment selection process. Hence, too small investments are potentially non-beneficiary for two reasons. First, the overall transaction costs to diligently assess an investment are too large compared to the actual amount of money

¹⁰⁹ Cf. Tyebjee and Bruno (1984), p. 1052-1054; Achleitner (2001), pp. 523-529.

¹¹⁰ Cf. Sweeting (1991), p. 610.

¹¹¹ Cf. Tyebjee and Bruno (1984), p. 1056; Bender (2010), pp. 26-27.

¹¹² Cf. Riquelme and Rickards (1992), pp. 508-509.

¹¹³ Cf. De Clercq and Dimov (2007), pp. 585-612; Gompers, et al. (2008), p. 1-23; the detailed discussion of the interaction between specific VC related factors, like the previous industry knowledge of the venture capitalists, or certain VC investment strategies, like funding of seed start-ups only, on the overall investment performance is part of chapter 3 to chapter 5.

¹¹⁴ Cf. Coyle (2000), p. 27.

the venture capitalist ultimately invests. Secondly, considering the total fund size the venture capitalist might end up with too many investments which subsequently require his time for monitoring and further investment development. On the other hand, too large investments are typically not followed either for two reasons. First, the allocation of too much funds into one single investment reduces the ability to sufficiently diversify the portfolio of the venture capitalist.¹¹⁵ Secondly, more technically the venture capitalist is commonly prohibited through the financing agreements with his LPs to allocate more than a certain percentage of the entire funds in one specific company. Similar to the previous argument, this investment limitation is introduced to reduce the overall investment risk of the VC fund. Figure 2-11 summarizes minimum investment thresholds for German early stage investors. Approximately 56% of the venture capitalists operate with a minimum investment size of at least half a million Euros. The same study reveals that about 85% of the entire deal flow is rejected through the initial screening process. As these venture capitalists have an average deal flow of 375 investment proposals (median of 300), this means that the average VC runs a more profound analysis on up to 55 investments per year.

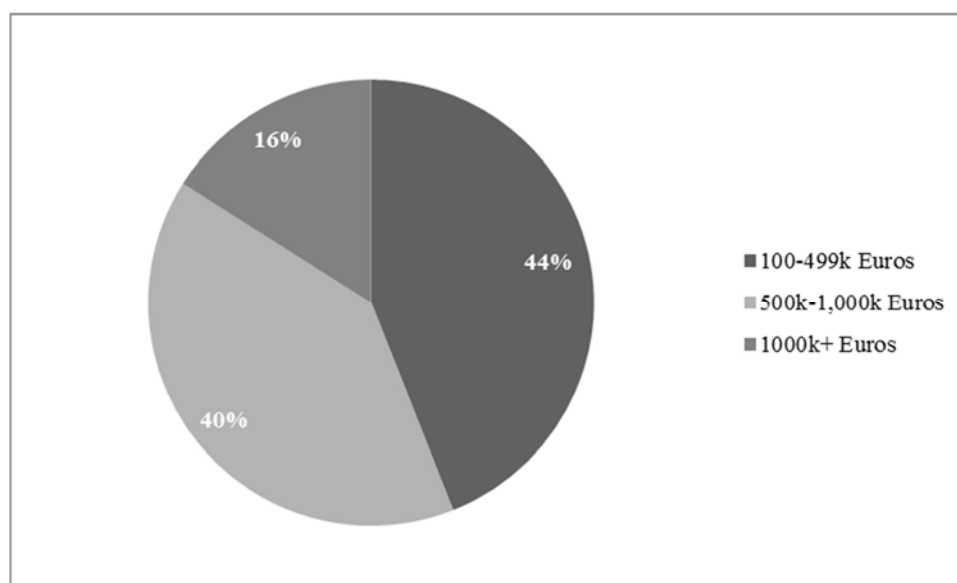


Figure 2-11: Venture Capital Minimum Investment Volumes¹¹⁶

¹¹⁵ Cf. Mason and Harrison (1995), p. 155; Bender (2010), p. 27.

¹¹⁶ Cf. Achleitner, et al. (2010), pp. 27.

This continuative analysis, which begins once an investment passes through the initial screening process, is called *due diligence*. Typically, business due diligences, financial due diligences and legal due diligences are the three most important activities.¹¹⁷ Through these activities, the VC firm intensively checks on four important dimensions of the potential portfolio company: management, market, product/service and financials. This process ensures that the VC is actually financing a high potential company. If the due diligence shows that a company does not have the required growth potential, the investment process is ended at that point.¹¹⁸

According to a meta-analysis foregone by FINGERLE, the management team represents the most important investment criterion (see Table 2-1). Thus, there is broad consensus in the literature regarding the prime importance of the top-management team for the success of the venture.¹¹⁹ Excellence in leadership, industry expertise as well as management capabilities of the founding team are crucial investment characteristics. Second, the general market opportunity is of importance. As discussed in chapter 2.1.2, only if the analyzed company needs can growth sufficiently large to provide an interesting investment case, it is considered as investment opportunity at all.¹²⁰ The third most important decision criterion is the company's product and services. With regard to this criterion, venture capitalists look for unique and proprietary products or technology that is preferably protected by intellectual property rights or offer alternative features that represent barriers to competing market entries. Last, as it is the venture capitalist's primary goal to achieve an attractive financial return on any investment, they diligently analyze important financial criteria as well. Short time to break-even and a good opportunity to exit the investment with high rates of return are of key interest.¹²¹

Although management is frequently assessed to be the most important investment criterion, KNOCKAERT ET AL. provide another interesting perspective on the investment behavior of venture capitalists. In their study, they identify three different clusters of venture capitalists which

¹¹⁷ Next to these topics that are always part of the regular due diligence process, certain investment opportunities require further review on special topics like environmental or regulatory issues for clean-tech investments.

¹¹⁸ Cf. Fingerle (2005), p. 75.

¹¹⁹ Cf. Wells (1974); Tyebjee and Bruno (1984); MacMillan, et al. (1985); Rea (1989); Carter and van Auken (1994); Bacher and Guild (1996); Muzyka, et al. (1996); Zutshi, et al. (1999); Pries and Guild (2002); Brettel (2002); Knockaert, et al. (2010).

¹²⁰ SAHLMAN states that a company that cannot reach annual revenues of about \$50 million in five years will have a hard time finding venture capitalists willing to invest in the company (Sahlman (1997), p. 101).

¹²¹ Cf. Carter and van Auken (1994), p. 66; Fingerle (2005), p. 76.

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differ from each other by their most important selection measure: technology investors, financial investors and people investors. Accordingly, technology investors focus primarily on the attractiveness of the involved technology. Hence, the future potential of the respective technology and its expected future impact are of particular importance. Financial investors, on the other hand, attach more importance to a certain set of financial indicators such as return on investment or expected growth rates. People investors, finally, emphasize on the “human factors such as leadership capacities of the entrepreneur and the quality of the team”.¹²²

Study	Management	Market	Product/ Service	Financials
Wells (1974)	1	3	2	-
Tyebjee/Bruno (1984)	1	3	-	2
MacMillan/Siegel/Subbanarasimha (1985)	1	2	4	3
Rea (1989)	3	1	2	-
Carter/van Auken (1994)	1	2	3	4
Bacher/Guild (1996)	1	2	3	4
Muzyka/Birley/Leleux (1996)	1	4	2	3
Zutshi et al. (1999)	1	2	3	4
Pries/Guild (2001)	1	2	3	4
Brettel (2002)	1	3	2	4
Knockaert/Clarysse/Wright (2010)	2	3	4	1
Meta-Ranking based on Average	1	2	3	4
Meta-Ranking based on Median	1	2	3	4

Table 2-1: Importance of Venture Capitalists Investment Criteria¹²³

As a result of this intensive screening and due diligence process, a small fraction of the entire deal flow receives financing at all. ACHLEITNER ET AL. find an overall investment rate for early stage investors of merely 3.7%.¹²⁴ This is in line with other VC studies that find an investment ratio in the range between 2% and 10%.¹²⁵ These small investment ratios prove the fact that many start-ups often lack sufficiently sustainable business models that make them attractive to

¹²² Knockaert, et al. (2010), p. 357.

¹²³ Source: Own extension based on Fingerle (2005), p. 76.

¹²⁴ Cf. Achleitner, et al. (2010), p. 34.

¹²⁵ Cf. Schröder (1992), p. 162; Vater (2002), p. 153; Petty and Gruber (2011), p. 178.

receive VC financing. The same study reveals that with 47%, by far the largest amount of transactions was ultimately sourced from one's own proprietary network. This is followed by deals initiated by other private equity companies or business angles which represent another 19%. This indicates a higher quality of deals that are sourced on the basis of personal relationships. Alternatively, one can argue that the personal recommendation of a company is generally perceived to be an important signal of quality.¹²⁶ Often, the personal recommendation is assessed considerably more important for the ultimate investment decision than the general business plan.¹²⁷

At the end of the due diligence process, the venture capitalist makes the general decision to pursue an investment in the analyzed company. However, even after an extensive due diligence process, the potential investment continues to be of high-risk for the venture capitalist. Therefore, the subsequent *investment structuring* process pursues the primary goal to reduce existing investment risks on the one hand and to fix terms that enable attractive future investment pay-offs on the other hand.¹²⁸ Resulting, the relevant negotiation as well as contracting activities of most venture-capital transactions revolve around the need to “strike a balance between the concerns of the founders (such as dilution of ownership and loss of control) and the concerns of the venture capitalist (such as return on investment and mitigating the risk of company failure)”.¹²⁹ This is of particular importance as the ability of the venture capitalist to closely control the utilization of capital by management is limited, and the investment profile covers a long horizon.¹³⁰

A multitude of various topics are negotiated throughout the investment process. Most of them are already decided upon early on in the investment process and documented by means of a so called term sheet. This document outlines the most important conditions of the transaction

¹²⁶ Cf. Tyebjee and Bruno (1984), p. 1065.

¹²⁷ Cf. Steier and Greenwood (1995), p. 337.

¹²⁸ The indicated chronological separation between due diligence phase and investment restructuring phase is in practice less evident. In reality, a VC investment process is often characterized by several activities that are executed at the same time. Hence, an agreement on “deal-breaking” deal characteristics (like an indicative valuation of the company) is often early on negotiated and documented by means of a so called term sheet. This is a reasonable procedure which allows the venture capitalist to better assess the overall probability for an actual transaction. Apparently, a venture capitalist is only willing to enter into a comprehensive due diligence exercise if a suchlike agreement substantially increases the probability of an ultimate investment success.

¹²⁹ Sherman (2012), p. 1.

¹³⁰ Cf. Ljungqvist and Richardson (2003), p.1.

in a bull-pint manner. Thereby, not only the relevant financial aspects but also additional investment rights and other agreements are established. The financial aspects characterizing the structure of a transaction embrace topics like the valuation of the portfolio company, the ultimate funding requirements and the subsequent utilization of funds, or the character of the exploited financial instruments.¹³¹ Of particular interest is thereby the negotiation of the transaction price. The derived value in combination with the overall financing need of the venture defines the percentage of ownership that management needs to render for the participation of the VC. Thereby, the valuation process frequently turns out to be a challenging task. Despite an intensive due diligence process, the determination of an adequate valuation remains a complex exercise.¹³² The financing need is dependent on the specific business plan. Typically, VC financings are not transferred as one lump-sum payment, but rather split into several smaller tranches at different points in time. This procedure is chosen in order to give the investor the ability to react on current developments and thus reduce the potential value at risk in case of an investment failure. In addition, later tranches are frequently linked to certain operational milestones. The concept of milestone financing bears the potential to significantly reduce the total amount of an investment loss as additional money is only provided if the portfolio company develops in line with the budgeted business plan.¹³³

Next to these financial considerations, “additional investor rights and agreements are of high [importance] for the financing relationship because these rights have an impact on the distribution of power and wealth between the venture capitalist and the entrepreneurial team”.¹³⁴ BENDER identifies seven categories of different investment rights which are frequently granted to venture capitalists. First of all extensive information rights allow the venture capitalist access to relevant information and guarantee him to closely monitor the management team throughout the investment period. Second, a certain set of control rights enable the VC to take different kind of actions that he believes are suitable to successfully develop the venture. Most importantly, suchlike rights guarantee the venture capitalist to decide on crucial business decisions like on the potential add-on acquisitions of complementary companies or on the international

¹³¹ Cf. Bender (2010), pp. 32-35.

¹³² Cf. Beaton (2010); Achleitner and Nathusius (2004); Damodaran (2010); ACHLEITNER AND NATHUSIUS discuss in detail venture characteristics that make their valuation difficult. In addition a detailed introduction in different valuation methodologies that are frequently used to value start-up companies is provided.

¹³³ Cf. Sahlman (1990), pp. 506-507; Gompers (1995), pp. 1461-1489; Dai (2011), pp. 1-51.

¹³⁴ Bender (2010), pp. 34.

expansion of the business. Typically, these rights are executed through board representation of responsible key persons of the VC firm. Frequently, it is the participation of a venture capitalist that forces an entrepreneurial company to finally establish a suchlike controlling entity like a board of directors.¹³⁵ Third, non-compete clauses are included in the financial agreement in case that a key person to the business quits his job during the investment period. Due to these clauses, the person is prohibited to be active within the same industry for a certain period of time in order to prevent the emergence of direct competitors building upon proprietary knowledge of the portfolio company. These clauses are often indispensable in particular for early-stage VC firms, as often the entire value of the portfolio company is initially connected to the value of its human resources, i.e. its management. Fourth, just like information rights, milestone agreements like earn-outs are utilized.¹³⁶ Thereby, the utilization of suchlike agreements pursues two different goals. On the one hand, milestones represent important performance incentives for the entrepreneur to timely achieve certain predefined goals. This way the operational goals provide guidance to the entrepreneur to manage his operations with focus on certain operational objectives. On the other hand, milestone agreements provide to some extent additional investment security for the venture capitalist. In case of a venture failure, typically only the amount that has already been invested is recorded as a loss. Fifth, cash flow rights reduce the overall investment risk of the venture capitalists. Through so called liquidation preferences, dividend preferences and/or anti-dilution provisions, the venture capitalists secures preferred treatment in case of liquidity events which technically helps the investor to achieve at least the repayment of his initial investment amount.¹³⁷ Sixth, the implementation of rights of first refusal and preemptive rights guarantee the venture capitalists to participate in future financing rounds. This is of interest, as it is the ownership at exit that substantially drives investment returns. Seventh, disinvestment rights are of interest in the preparation of an exit event. Typically, these rights allow the venture capitalist despite being a minority shareholder only to trigger an exit event like the sale to a strategic investor or an IPO. The specific influence of some of the most important VC investment rights on the investment success of single VC transactions will be analyzed throughout chapter 3.2, in particular in chapter 3.2.4.

¹³⁵ Cf. Gompers and Lerner (2004), p. 133.

¹³⁶ Cf. Fiet, et al. (1997), pp. 350-351.

¹³⁷ Cf. Kaplan and Strömberg (2003), pp. 290-292.

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The pre-investment phase ends with the successful closing of the transaction. In contrast to mutual investment activities, the *investment development* phase is characterized by a high level of activism of the venture capitalist, i.e. often the actual work of the venture capitalist starts with value-adding activities within the post-investment phase. Through the provision of many non-financial activities, venture capitalists are often esteemed to be “company builders rather than financiers” or “consultants with a financial interest”.¹³⁸ Depending on the overall level of operational involvement, one typically differentiates among ‘hands-on’ and ‘hands-off’ investment styles. As most VC firms are thereby assessed to demonstrate a substantial amount of investor activism, hands-on support for portfolio companies is typically seen as one of the defining features of the VC asset class.¹³⁹

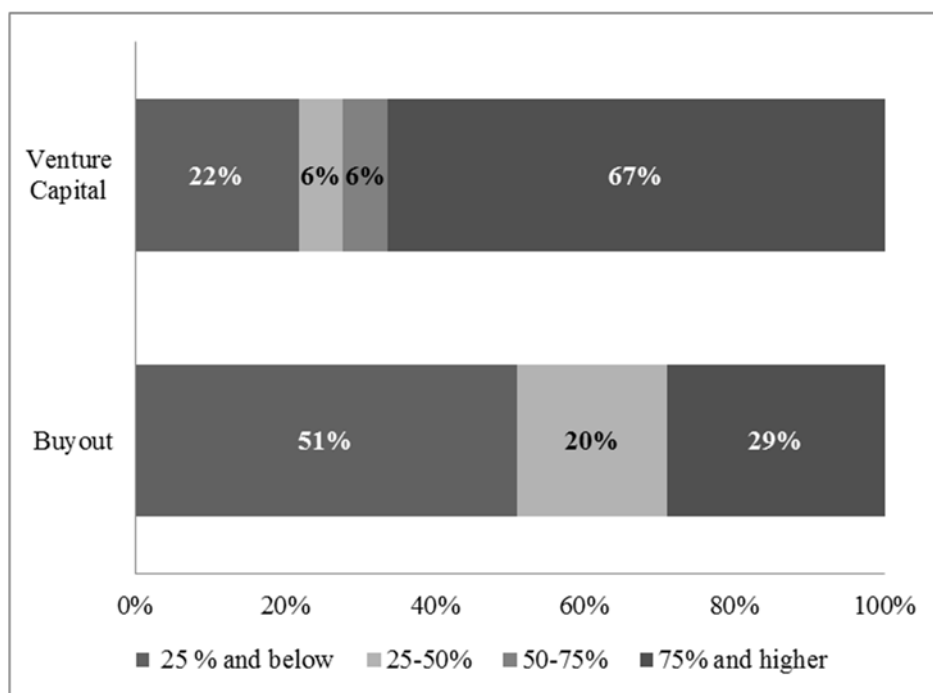


Figure 2-12: Level of Hands-on Support Provided to Portfolio Companies by Investment Stage¹⁴⁰

¹³⁸ Fried and Hisrich (1995), p. 102.

¹³⁹ Cf. Sapienza (1992), pp. 22-23; Wright and Robbie (1998), pp. 525-526; Hellmann and Puri (2002), pp. 169-179; Bottazzi, et al. (2008), pp. 488-512.

¹⁴⁰ Cf. Achleitner, et al. (2010), pp. 47.

Figure 2-12 shows the level of intensity, private equity investors utilize hands on support in order to maximize investment success. Hence, compared to buyout investors (29%) more than two thirds (67%) of early stage investors provide hands-on support to more than 75% of their portfolio companies. These numbers reveal that these activities are part of almost any VC financing relationship and, hence, document the importance for the entire VC investment process.

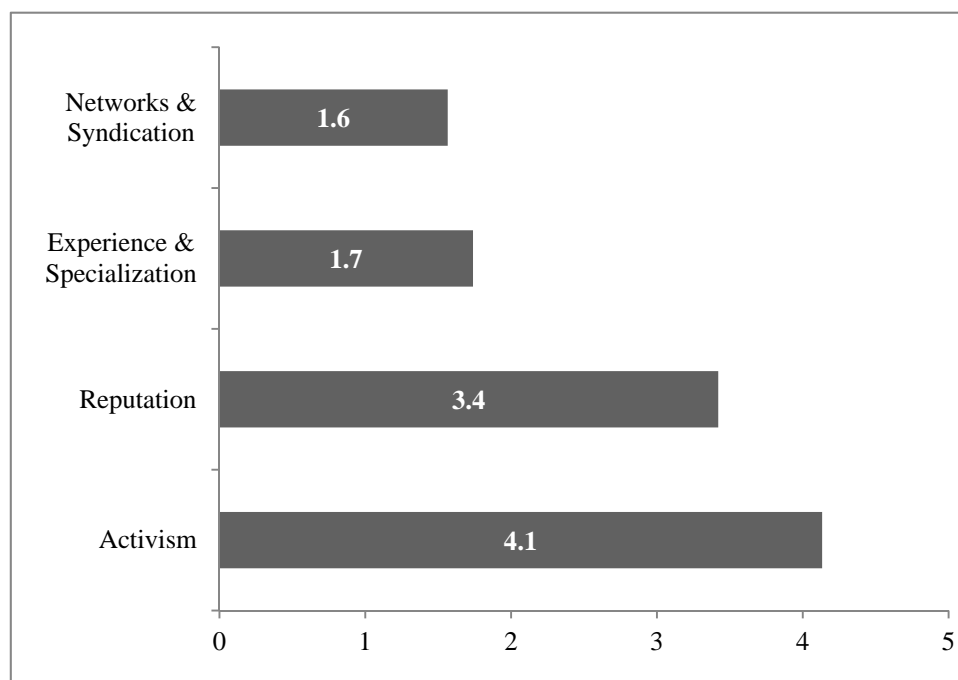


Figure 2-13: Value-Adding Activities of VC Firms¹⁴¹

Non-financial activities provided by the venture capitalist can be attributed to any of the following four areas: Experience & specialization, networks & syndication, reputation and activism. The ultimate purpose of any of these activities is to increase the fundamental value of the portfolio company in order to optimize the future investment return (see chapter 3.2.2). Thereby, the kind of additional support that is typically provided depends on each portfolio company individually. Recent results for the German private equity market indicate that the provision of know-how based on relevant operational as well as industrial experience as well as the access to proprietary networks of the venture capitalist seem to be the most important activities (Figure 2-13). With an average grade of 1.6 respectively 1.7, these two value-adding

¹⁴¹ Based on data from Achleitner, et al. (2010).

initiatives are assessed as crucial activities throughout a venture capitalist's investment period.¹⁴² In contrast, the direct transfer of reputation from the venture capitalist to the portfolio company seems to be less essential (average grade of 3.4). With an average grade of 4.1, the venture capitalist's value addition through direct involvement in the operational processes of the portfolio company seems to be least important. In contrast, as financial intermediaries, venture capitalists favor to provide additional value to their portfolio companies through indirect provision of social and intellectual know-how.

The *investment exit* represents the final phase of the typical VC process. Considering the entire VC investment process, it is a VC fund's ultimate goal to maximize its financial return by means of a successful exit event.¹⁴³ Once the investment exit is achieved, the risk of capital loss ceases and the venture capitalist can pay back its investors or reinvest the funds.¹⁴⁴ Thereby, the actual exit is a process which contains the identification of the exit channel as well as the preparation and the realization of the exit.¹⁴⁵ Any problems regarding the execution of the exit might lead to lower rates of return of the investment as the selling price is potentially reduced or the holding period prolonged.¹⁴⁶ To counter any difficulties regarding the exit, venture capitalists typically enter an investment with a clear exit strategy or at least consider them during the initial investment case valuation. According to a study by PFAFFENHOLZ, 93% of VC firms consider topics relevant for the exit already before the initial investment and assign a very high or even crucial importance to it.¹⁴⁷ Similar results can be found by CUMMING AND JOHAN who analyze the formal existence of preplanned exit strategies at the time a VC investment.¹⁴⁸

Fundamentally, there are five primary types of VC exits that can be identified: an IPO (in which the venture is listed at a public stock exchange), a trade sale (in which the venture is sold to a larger firm), a secondary sale (in which the venture is sold to another venture capitalist

¹⁴² The participants of this study were asked to grade the importance of single hands-on activities on a scale reaching from 1 (= very important) to 5 (= not important).

¹⁴³ Cf. Metrick and Yasuda (2011), pp. 3.

¹⁴⁴ Cf. Paffenholz (2004), p. 36.

¹⁴⁵ Cf. Prester (2000), p. 145.

¹⁴⁶ Cf. Paffenholz (2004), p. 2.

¹⁴⁷ Cf. Paffenholz (2004), p. 169-170.

¹⁴⁸ Cf. Cumming and Johan (2008b), pp. 1209-1241.

whereas the entrepreneur(s) maintain(s) his/their shareholding), a buyback (in which the venture is repurchased by the entrepreneur(s)) and a write-off (in which the unsuccessful venture is fully liquidated).¹⁴⁹ Considering these exit types, IPOs are commonly perceived to be the most preferred type of exit and acquisitions are seen as the second best option leading to a commonly perceived pecking-order of VC exits.¹⁵⁰

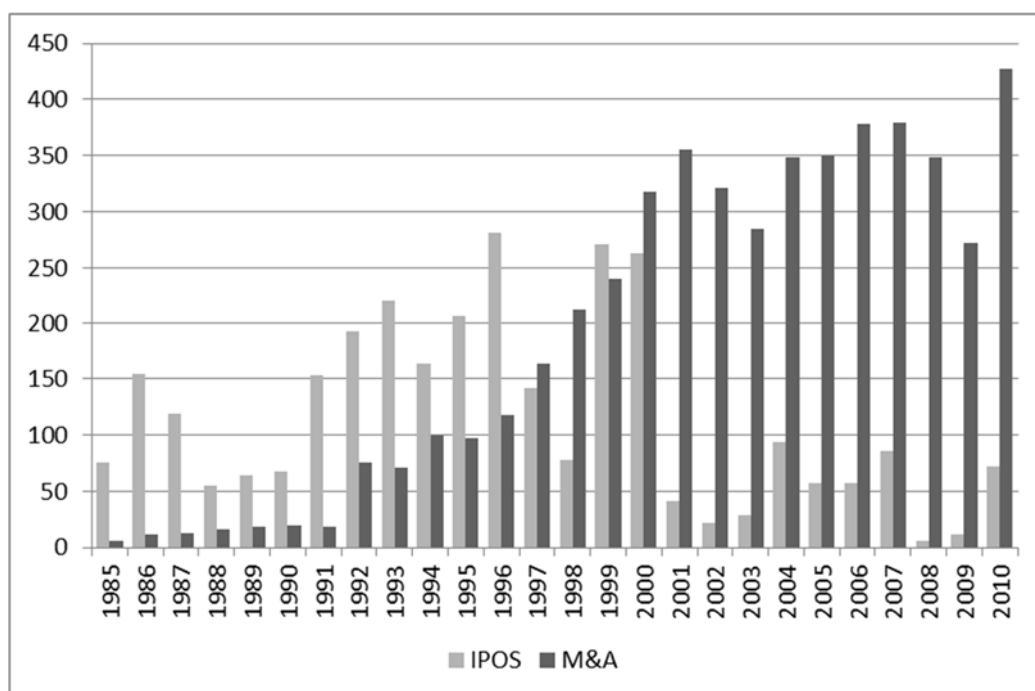


Figure 2-14: US IPO and Acquisition Exits Over Time¹⁵¹

The availability of specific exit types varies substantially over time. Hence, in particular IPOs are strongly dependent on the general sentiment of the relevant public equity markets. For that reason, capital market experts speak about so called “IPO windows” when they talk about periods which are favorable to pursue a public listing of a portfolio company.¹⁵² Figure 2-14 summarizes the exit activity for the most important VC market, the US, for the period between 1985 and 2010. The progression of IPO exits throughout that period provides evidence for volatile exit markets. Hence, years of exceptional high public listing activities are followed by

¹⁴⁹ Cf. Cumming and MacIntosh (2003), p. 512.

¹⁵⁰ Cf. Cumming and Johan (2008b), pp. 1214.

¹⁵¹ Cf. NVCA (2011).

¹⁵² Cf. Lerner (1994b), p. 314.

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years where hardly any venture-backed company became public at all. In contrast, the acquisition exit converted into the most important type of exit from a pure numerical perspective in particular during the last decade. This observation is part of the motivation to analyze returns from acquisition exit in more detail as part of the subsequent empirical analysis (see chapter 5).

3 Performance of Venture Capital Investments

Similar to other financial asset classes, the computing of financial returns on VC investments is of importance. As profit-oriented investors, it is the primary objective of the venture capitalist to maximize the financial return for his investors.¹⁵³ Thereby, it turns out that the definition of performance in the field of VC is rather complex and needs to be carefully considered. A good understanding of performance and performance measurement is therefore a prerequisite for any empirical analysis of performance drivers. To address this issue, the subsequent chapter introduces performance measurement in the VC industry.¹⁵⁴ Therefore, at first, commonly used performance measures are introduced and successively assessed with regard to their general applicability in the VC context. Secondly, with regard to the general structure of VC investments the concept of gross versus net returns is introduced. Thirdly, the most important data challenges are discussed. Obtaining reliable data for calculating returns proves to be a difficult task. Fourthly, an overview of historical returns to VC is provided. Thereby, a potential delta between expected and achieved returns from the perspective of the venture capitalist is presented.

3.1 Performance Measurement

3.1.1 Venture Capital Return Measures

The analysis of determinants of VC performance is at the core of this thesis. Hence, this chapter serves to introduce the term performance and performance measurement within the VC industry. Thereby, performance is first and foremost associated with the absolute return, i.e. capital appreciation that is achieved throughout the investment period. Focusing on absolute returns only, this perspective is said to be one-dimensional.¹⁵⁵ In contrast, a two-dimensional

¹⁵³ Cf. Bygrave, et al. (1999), p. 309; A relative young discipline in VC research is dedicated to so called social entrepreneurship respectively social investing (Scarlata and Alemany (2008); John (2006) or Achleitner, et al. (2007)). In contrast to regular VC investing, social investing, although similarly focused on newly established ideas, is substantially less focused on financial investment returns but on the achievement of e.g. social, cultural, and environmental goals.

¹⁵⁴ The focus of this chapter is on the introduction to the most commonly utilized performance measures in the VC industry. Recently, more and more research on the overall suitability of single performance measures has been published. However, considering the focus of the subsequent deal-level focused analysis, the discussion and assessment of these various measures has overall only limited relevance for the subsequent analysis. Nevertheless, the most important arguments will be shortly presented in the subsequent sections. For the interested reader, a more comprehensive overview on this topic can be found by Askar (2008).

¹⁵⁵ Cf. Bruns and Steiner (2007), pp. 48.

consideration takes into account the respective risk of the investment as well. Accordingly, performance is rather perceived as risk-adjusted return, i.e. the absolute return in relationship to the perceived investment risk.¹⁵⁶ In order to further assess the general performance of an asset class, the concept of benchmark returns is introduced to the field of investment analysis.¹⁵⁷ This way, the performance of an investment is ultimately not only compared to the fundamental risk of the investment but also to the performance of an alternative investment that could have been made instead. As a result, the performance can be easily compared among different asset classes or investment decisions:¹⁵⁸

$$\text{Investment Performance} = \frac{\text{Investment Return} - \text{Benchmark Return}}{\text{Risk Measure}}$$

For the purpose of this thesis, the focus is primarily on the one-dimensional perspective on VC returns. The emphasis is on factors that drive the absolute return of individual VC investments. Accordingly, the thesis is less interested on questions like (i) is the achieved return adequate from a risk-return-perspective or (ii) is the achieved return attractive compared to alternative asset classes.¹⁵⁹ Instead, building upon a large proprietary data set of individual VC transactions for the period between 1980 and 2008 the own empirical analysis focuses on specific examinations of absolute deal-level investment returns. This way, the study rather provides evidence on how VC investment returns are achieved then on whether VC is an interesting and ultimately competitive asset class compared to alternative financial products.

Independent from these considerations, an adequate measure for absolute returns for VC transactions is required. The main performance measure that is used both for private equity investments and corporate projects in this context is the IRR. Both the EVCA as well as the BVCA use the IRR as their standard performance measure.¹⁶⁰ The importance of the IRR is underpinned by its common utilization in the business world. Hence, previous studies report

¹⁵⁶ Cf. Zimmermann (1991), p. 164; Bruns and Steiner (2007).

¹⁵⁷ Cf. Jensen (1968), pp. 389-416.

¹⁵⁸ Cf. Bruns and Steiner (2007), p. 48.

¹⁵⁹ More information on risk-adjusted deal-level return analysis can be found by Cochrane (2005) and Braun, et al. (2011) for VC respectively PE. Diller and Kaserer (2009) provide a discussion of VC as well as PE fund-level returns for a comprehensive European data set.

¹⁶⁰ Cf. EVCA (2006), pp. 37.

that approximately 75% of so called chief financial officers i.e. employees in charge of financial planning and/or financial analysis use the IRR as their primary tool to evaluate new and ongoing projects.¹⁶¹ Accordingly, the IRR can be said to be the standard measure which is most commonly used not only by practitioners but also by academics. Formally, it is defined as the discount rate which makes the Net Present Value of a series of cash flows equal to zero:

$$\sum_{t=0}^T \frac{CF_t}{(1+IRR)^t} = 0$$

Although, the IRR is the most frequently used measure of return, there are multiple shortcomings that make its use in the VC context at least problematic. Well-known, although rather technical shortcomings are the possibility of multiple solutions, computational difficulties as well as the sensitivity to cash flow timing and project scale.¹⁶² More importantly, the IRR assumes that any intermediate cash flow, i.e. cash flows that are distributed to the venture capitalist throughout the investment period, can be reinvested at the IRR itself. KASERER AND DILLER doubt that this supposition can be met in reality: “As the investment opportunities of a private equity fund may be rather singular, this is not an especially sound assumption.”¹⁶³ The second consequence of this pitfall is that performance appears more dispersed than it really is. “The re-investment assumption means that funds with high IRR have a higher IRR than effective rate of return and funds with low IRR (below re-investment rate) have a lower IRR than the effective rate of return.”¹⁶⁴ As a consequence, the volatility of the measured returns is potentially exaggerated. Third, due to this limitation the average IRR of individual investments is typically different from an IRR that is calculated considering the aggregated cash flows of the same projects. Accordingly, “it is possible that an average IRR is above a benchmark and yet, if an investor would have invested in each fund, he would have underperformed the benchmark.”¹⁶⁵ This is in particular of interest in the context of private equity where aggregation is

¹⁶¹ Cf. Graham and Harvey (2001), p. 197.

¹⁶² Cf. Da Rin, et al. (2011), p. 77; additionally, Kaserer and Diller (2004a), Askar (2008) and Phalippou (2008) provide detailed discussion of problems in using IRR as performance measure in VC/PE investing.

¹⁶³ Kaserer and Diller (2004a), p. 32.

¹⁶⁴ Phalippou (2008), p. 4.

¹⁶⁵ Phalippou (2008), p. 4.

an important issue because performance is negatively related to duration. Finally, related to this issue is the incentives it provides to managers to strategically time their cash flows.¹⁶⁶ Hence, in practice one cannot rule out that some fund managers can play on IRR flaws to artificially improve their overall fund performance. This way, fund managers would be incentivized to be strategic with their cash flow timing and tend to terminate good investments early. Due to these limitations, there is an ongoing debate about the general applicability of the IRR to assess VC performance. Reflecting on the mentioned pitfalls, most of these critics are however in particular or even exclusively relevant for the assessment of VC fund-level returns. Issues like unreasonable reinvestment considerations or the pooling of cash flow are less critical for the analysis of single VC investment returns on the basis of actual realized cash flows.¹⁶⁷

To mitigate some of these problems, performance multiples serve typically as an alternative return measure. Hence, the EVCA just like many researchers suggests providing both IRR and multiples in order to give potential investors the ability to assess the historic fund performance more completely.¹⁶⁸ Thereby, three different multiples are commonly used to assess performance both on deal-level as well as on fund-level.¹⁶⁹ The demand for three different multiples is in particular evoked by specific VC investments characteristics that have previously been introduced: illiquidity and extended holding periods. Due to these characteristic, venture capitalists are frequently in need to report the performance of individual investments which have not yet fully been completed. The same is apparently applicable for entire funds.

$$DPI_N = \frac{\sum_{t=0}^N D_t}{\sum_{t=0}^N TD_t}$$

¹⁶⁶ Cf. Phalippou (2008), pp. 5-6.

¹⁶⁷ This is important to note as most of the own empirical analysis (in particular chapter 4 and 5) is focused on the analysis of returns from single VC investments rather fund-level returns. The utilization of IRR is therefore less critical.

¹⁶⁸ Cf. EVCA (2006), p. 27; Metrick and Yasuda (2011), p. 13.

¹⁶⁹ Cf. Diller (2007), pp. 90-91; the subsequent presentation of frequently used multiples within the VC industry reverts back to the publication by Diller (2007). Similar descriptions are published by relevant industry associations (EVCA (2006)) or by relevant data providers (e.g. TVE).

The first multiple which is typically reported is the “Distributed to Paid in Capital” multiple (DPI). This factor represents the ratio of the total of already distributed capital, i.e. paid out cash flows (D_t), and the total of all committed capital, i.e. paid in cash flows (TD_t) since the beginning of the investment or the lifetime of the VC fund. Accordingly, this multiple captures returns that have been fully collected until the respective reporting date only. Hence, the total investments outflows are compared to the amount of money which has already been “harvested” from single investments. As a result, the DPI equals zero until the very first (positive) cash-flow and increases then steadily the way additional cash flows are distributed to the investors. A final DPI multiple above one indicates that the investors retrieves more money from the investment or fund than has originally been invested.

$$RVPI_N = \frac{RNAV_N}{\sum_{t=0}^N TD_t}$$

If one would assess the performance of an investment or fund by looking at the current DPI only, one would however disregard additional value that is at the reporting date still concealed in existing shareholdings that have not yet been liquidated. To capture this “hidden” performance, venture capitalists typically report the “Residual Value to Paid in Capital” multiple (RVPI). In contrast to the DPI, this multiple represents the ratio of the current book value of the remaining active investment(s) of the fund ($RNAV_N$) and the total of all committed capital, i.e. paid in cash flows (TD_t). Accordingly, at any reporting date this multiple represents returns that are ought to materialize in the future. In practice, the RVPI indicates the remaining book value that is still to be distributed to the (fund) investor(s). Hence, towards the end of the holding period of an investment respectively towards the maturity of a fund, this factor should be a good predictor of cash flows that yet will be paid out to the investor(s).¹⁷⁰

¹⁷⁰ The informative value of this performance measure is highly dependent on the overall quality of the fundamental reporting procedures (Ljungqvist and Richardson (2003), p. 2; Diller (2007), pp. 81-90). Thereby, the complexity to come up with a reasonable valuation for single VC projects, i.e. investments, is a critical issue. In this regard, a recent study by Mulcahy, et al. (2012) reveals that VC firms frequently report overstated intermediate valuations, i.e. expected returns based on assumed book values (see chapter 2.1.1).

$$TVPI_N = DPI_N + RVPI_N = \frac{RNAV_N + \sum_{t=0}^N D_t}{\sum_{t=0}^N TD_t}$$

Finally, the “Total Value to Paid in Capital” multiple (TVPI) represents the sum of the previously introduced DPI and RVPI. Hence, the TVPI takes both realized and unrealized cash flows (values) into account. This way, at any point in time the TVPI proxies the cash multiple that should ultimately be returned to the (fund) investor(s). Apparently, in the case of fully realized transaction, i.e. whenever the full value of an investment has been distributed to its investors (respectively there is no residual book value left) the TVPI equals the DPI. This is important to note as the own empirical analyses explicitly focuses on fully divested transactions only. As a consequence, any obstacles with regard to the requirement to correctly measure any remaining book value can be neglected.

As they provide a simple and intuitive result for the investment performance, these multiples are popular among many investors. Advantageously, multiples represent a measure for the entire value increase throughout the full investment period. This is in contrast to the IRR which embodies an annualized performance figure. Nevertheless, the multiples have yet another drawback as they completely disregard the time value of money and consequently the opportunity costs of the invested capital. This is critical as for an investor it makes usually a significant difference whether the money was returned after 3, 5 or 10 years.¹⁷¹

Next two investment multiples and the IRR, several other qualitative as well as quantitative measures can be found to assess the success of VC transactions. The two primary alternatives – the modified IRR (MIRR) and the public market equivalent (PME) – which both have more recently gained importance in particular in academic discussions, are for the matter of completion shortly presented in the following.¹⁷²

$$MIRR = r \sqrt{\frac{\sum_{t=0}^T CF_t^+ (1+r)^{T-t}}{|\sum_{t=0}^T CF_t^- (1+r)^{-t}|}} - 1$$

¹⁷¹ Cf. Askar (2008), p. 43.

¹⁷² However, due to their limited practical relevance to date, the subsequent empirical analysis focuses exclusively on IRR and multiples.

The modified IRR (MIRR) is a measure similar to the IRR but does not suffer from the criticized reinvestment hypothesis. As the equation for the MIRR shows, the yearly return is calculated over all positive cash flows CF^+ compounded to the end of the project ($t=T$) in relation to all negative cash flows CF^- discounted to the starting point ($t=0$).¹⁷³ Hence, to compute a modified IRR, one assumes that the capital committed to a fund is put on an account that earns a realistic rate of return r (e.g. 10% per year). Hence, the calculation of the MIRR is illustrated by the following plausible procedure. The present value of the funds which are going to be invested in a specific target firm is known at the point of the initial investment and is put on a bank account earning a certain constant rate (r). Whenever money is paid out to the portfolio firm it is taken from this account and all intermediary returns as well as the divestment proceeds from the portfolio firm are put on this account again. After the exit the yearly return is calculated using the account balance at the end of the investment over the balance at its start. The result is the MIRR.¹⁷⁴

The key assumption for the MIRR is therefore a constant rate of return which is applied to capital distributed throughout the investment period. In corporate finance typically the cost of capital is used.¹⁷⁵ On a VC fund-level the hurdle rates of return as defined in the funds' bylaws are typically suggested.¹⁷⁶ This makes sense from a theoretic point of view as this figure can be seen as an approximation for the return expected by the fund's investors and therefore is similar to the cost of capital. However, it is to some extent questionable whether this approach is feasible on the level of individual investments. Given the high illiquidity of VC as an asset class, transferring funds from one investment to another would take a lot of time and effort and is therefore unlikely to happen. SAHLMAN backs this consideration: "As investments yield cash [...] distributions are made to the partners rather than reinvested in new ventures."¹⁷⁷ Thus, one should rather assume that the funds currently not invested in the portfolio firm can be invested in liquid securities and yield the market rate of return. For this approach it does not make a difference whether the venture capitalist calls the entire funds from the fund investors at the point of the initial investment and keeps the total proceeds until the final divestment of the

¹⁷³ Cf. Kaserer (2009), p. 99.

¹⁷⁴ Cf. Phalippou (2008), p. 9.

¹⁷⁵ Cf. Kaserer (2009), p. 99.

¹⁷⁶ Cf. Phalippou (2008), p. 9.

¹⁷⁷ Sahlman (1990), p. 488.

portfolio firm or whether the venture capitalist calls funds repeatedly when needed and distributes free cash flows to its fund investors as soon as they are received. In the first alternative the venture capitalist, in the second alternative the fund investors need to hold liquid securities which can be converted to cash immediately when needed for the portfolio firm. So, either the venture capitalist or the fund investors can invest in the market portfolio and this return should be respected when calculating the MIRR.

The other suggested performance measure, which in particular in recent years is more frequently used within academic studies, is the Public Market Equivalent (PME). This measure proves to be in particular suitable when the return of an asset class to be compared to alternative investments. Reflecting on the initially introduced performance terminology, the PME is a more dimensional return measure that compares VC returns to broader capital market returns. Fundamentally, the PME is similar to the introduced MIRR. Hence, the PME “addresses the question of how much money a private equity investor would need in order to generate a cash flow stream with a public market investment equal to the cash flow stream generated by the private equity investment”.¹⁷⁸ KASERER AND DILLER provide the following comparison of two different investment strategies to clarify this concept: “Under strategy 1 the investor starts with a given amount of Euros that is exactly sufficient for financing all the drawdowns – on the assumption that the money not used for immediate drawdowns is invested in the benchmark a benchmark index until it is called by the GP. Simultaneously, the distributions paid to the investor are immediately invested in the index. In this way the investor is left with a final wealth figure at the maturity of the fund. Under strategy 2 the same amount of Euros is immediately invested in the benchmark index with a maturity equal to the fund’s lifetime. The PME is nothing else than the ratio of the final wealth under the first strategy to the final wealth under the second strategy.”¹⁷⁹ Building upon these considerations, the PME is expressed with the following formula:

$$PME = \frac{\sum_{t=1}^T cf_t \prod_{i=1+t}^T (1+R_{It})}{\prod_{i=1}^T (1+R_{It})}$$

¹⁷⁸ Kaserer and Diller (2004a), p. 33.

¹⁷⁹ Kaserer and Diller (2004a), pp. 33-34.

As a result, KASERER AND DILLER conclude that the PME is in particular suitable for ex-post benchmarking purposes: “In this case the known cash flows of a fund as well as the known benchmark returns are used for calculating the PME (...).”¹⁸⁰ In summary, the PME is the appropriate performance measure if the purpose of the analysis is to compare the attractiveness of private equity fund investing compared to alternative asset classes (e.g. public equity markets).¹⁸¹

One fundamental problem of all previously introduced performance measures is the requirement for detailed quantitative data in order to calculate them. Unfortunately, in particular on individual transaction level, this data is hardly available as general partners, i.e. venture capitalists, are not required to disclose them. As we will see throughout our analysis of performance drivers in chapter 3.2, many researchers looked for an alternative way to proxy VC performance. Detached from these purely quantitative performance measures above, the type of exit by which the portfolio company is finally divested is another frequently used measure for investment success. The applicability of this approach is justified through the analysis of the relationship between the type of exit and the actual financial investment performance. One important empirical finding of these analyses is the so called pecking-order theory of VC exits.¹⁸² Hence, research suggests that there are substantial performance differences among the three common types of VC exits: IPOs, trade sales and write-offs. However, given an overall plausibility of this finding (portfolio companies are certainly required to achieve substantial growth and profitability goals in order to qualify for an IPO), there is increasing critics on this approach which is primarily driven by severe data limitations. Thus, MCKENZIE AND JANEWAY find in their study a substantial amount of recorded IPOs by VC-backed companies which ultimately returned less than the initial investment sums: “The profitability of these IPOs varies substantially and the dot.com era in particular represented a unique environment, insofar as the number of unprofitable venture-backed IPOs was noticeably higher (...).”¹⁸³ This is an important finding, as conclusions that are frequently drawn through the performance approximation by means

¹⁸⁰ Kaserer and Diller (2004a), p. 34.

¹⁸¹ See among others Kaserer and Diller (2004a); Kaplan and Schoar (2005); Diller and Kaserer (2009); Harris, et al. (2011).

¹⁸² Cf. Bienz and Leite (2008), p. 2.

¹⁸³ McKenzie and Janeway (2011), p. 783.

of the achieved exit type should be interpreted with care. At least, a clear inference with actual financial returns by the venture capitalist could be misleading.

In summary, a rather comprehensive line-up of different performance measures is used in the context of VC. Each of them is to some extent characterized by reasonable advantages as well as disadvantages. Despite outlined limitations the following analysis focuses primarily on the IRR and (cash) multiples (TVPI as predominantly fully realized transactions are analyzed). Hence, these measures are most suitable if the analysis focuses on the examination of deal-level returns and their fundamental drivers. Besides, most of the critics that have been rightfully raised are to some extent mitigated within the subsequent empirical analysis. Hence, the criticism that fund managers manipulate their reported returns as they actively manage the duration of an investment is less relevant in the context of VC.¹⁸⁴ “(...) For most entrepreneurial firms, the duration from first investment until actual exit is determined by exogenous factors, such as market conditions and factors internal to the investee company itself that affect the timing of the exit.”¹⁸⁵ As a result, IRRs are less likely to be manipulated as compared to e.g. buyout investments where interim dividends can be used to manipulate this performance measure. A venture capitalist is well advised to re-invest any operational cash flows into his portfolio companies to allow them to grow sufficiently large to qualify for a proper exit at the end of the investment period. Accordingly, the problem of overoptimistic re-investment assumption should be considerably mitigated. Finally, the IRR as well as cash multiples are still by far the most frequently used performance measure. As a result an analysis of these return measures allows for a high degree of comparability.

3.1.2 Levels of Return Measurement – Gross versus Net Returns

Taking into account the typically applied organizational set-up of VC funds (see Figure 2-4), one fundamentally distinguishes between two types of investment returns: gross returns and net returns. Thereby, gross returns reflect all financial proceeds that are harvested by venture capitalists through their investment activities. Hence, all relevant cash flows, i.e. outflows in and out of the portfolio company, are considered. Whereas outflows are simply made of the money

¹⁸⁴ Cf. Phalippou (2008), p. 6.

¹⁸⁵ Cumming and Walz (2010), p. 734-735.

provided to the venture according to the negotiated financial agreement, inflows that are transferred back to the venture capitalist throughout the investment period can take different forms. First of all, money can be returned by means of intermediate cash dividends. However, due to the high financing requirements and limited profitability of most of the growing ventures, this kind of inflows rarely happen within VC investing. Rather, the vast majority of the proceeds are collected in case of a successful exit event. Depending of the type of exit, this is the point in time where the venture capitalist collects his investment proceeds in form of cash or publicly traded stock of the newly listed portfolio company. As long as the calculative basis for the computation of investment returns is not adjusted for any compensation (fees and carried interest) taken by the VC firm that is managing the investment, one speaks about gross returns.¹⁸⁶

By contrast, net returns are received by LPs that invest into VC funds. The cash outflows represent the contracted “capital contributions” that the fund investors successively make – typically on a deal by deal basis – when investing in a VC fund. The LP’s investment proceeds are all capital distributions from the VC fund to its investors. Once again, these distributions are typically made on a deal by deal basis, i.e. take place whenever the venture capitalist successfully divests a portfolio company. These returns are called net returns because they are net of all management and performance fees that the GPs retain according to negotiated fund agreements. Importantly, one also has to note that net and gross returns do not only vary with regard to their fundamental cash flows, but also with regard to timing: “For instance, capital contributions (the LPs’ outflows) happen prior to VC fund investments (the VCs’ outflows), and distributions (the LPs’ inflows) happen after the actual exit (the VCs’ inflows).”¹⁸⁷

Against the background of this distinction, it is important to note that these different measures, although clearly related, are typically utilized to answer different questions. Hence, gross returns are in particular useful to analyze the performance of single investment opportunities. Accordingly, they are most “appropriate for comparing performance across industries, geographies, investment stages and other fine-grained company characteristics”.¹⁸⁸ In addition, they are useful to analyze the effectiveness of value adding initiatives of venture capitalists. Hence, whenever deal-level related questions take center stage, gross return should be used

¹⁸⁶ Cf. Da Rin, et al. (2011), p. 73.

¹⁸⁷ Da Rin, et al. (2011), p. 74.

¹⁸⁸ Da Rin, et al. (2011), p. 74.

with regard to performance analysis. This, on the other hand, implicates that one is primarily interested from the perspective of the involved entrepreneur or invested VC. “In contrast, net returns focus on the performance of funds, and are appropriate for examining the performance of different VC firms that may have different expertise, different organizational structures or different portfolio investment strategies. Moreover, we can think of gross returns as a measure of the abilities of VC firms to generate returns, whereas net returns reflect the LPs capabilities of picking successful VC fund managers.”¹⁸⁹

Due to the nature of the collected data, the own empirical analysis in chapter 4 and 5 focuses exclusively on gross returns. However, this is appropriate as we are primarily interested in the determinants of individual transaction success, i.e. factors that have an impact on the return potential from individual investments independent from the compensation structure of the respective VC fund and its LPs. Figure 3-1 provides a schematic summary of the discussed perspectives and highlights the focus of this thesis.

	Gross Returns	Net Returns
Deal-Level	✓	✗
Fund-Level (GP)	✓	✓
Investor-Level (LP)	✗	✓

Focus of this thesis

Figure 3-1: Gross versus Net Returns and the Level of Perspective¹⁹⁰

Thinking about the actual distributions of returns, the perspective of the analysis has another important implication. Thus, next to the question whether gross or net returns are analyzed, ex-

¹⁸⁹ Da Rin, et al. (2011), pp. 74-75.

¹⁹⁰ Source: Own illustration.

post performance analysis differs substantially depending on the following three different levels of aggregation: (1) The level of the single portfolio company, (2) the level of a specific VC fund or (3) the level of an investor into one or several VC funds (e.g. fund-of-funds). Looking at Figure 3-2 which illustrates typical return distributions for each of these perspectives, the differences in fundamental return distribution become apparent: Hence, building upon data of US and European VC investments as well as on simulation calculations for fund-of-funds investment, WEIDIG AND MATHONET point out that it does not make sense for an inexperienced investor to engage in direct VC investments, as the involved risks are typically too high. Accordingly, they suggest investing in professionally managed VC funds.¹⁹¹ Considering the principles of portfolio theory, venture capitalists are able to reduce unsystematic risks associated with stand-alone investments by pooling several investments in their funds. Hence, Figure 3-2 illustrates that return patterns for individual transactions, i.e. deal-level performance, are highly skewed. Accordingly, approximately 30% of all transactions end as total write-offs, whereas on the other end of the success scale is characterized by a thin tail of extremely high multiples (sometimes above 100x money). In contrast, the return distribution of fund returns shows a “relatively symmetric distribution with substantially less fat tails and hardly any total losses. Hence, the fund, as a managed portfolio of 10 to 20 companies, induces significant diversification effects as compared to direct investments.”¹⁹² Finally, fund-of-funds investors almost completely avoid the risk of making any investment losses at all.

¹⁹¹ Cf. Weidig and Mathonet (2004), p. 9.

¹⁹² Weidig and Mathonet (2004), p. 12.

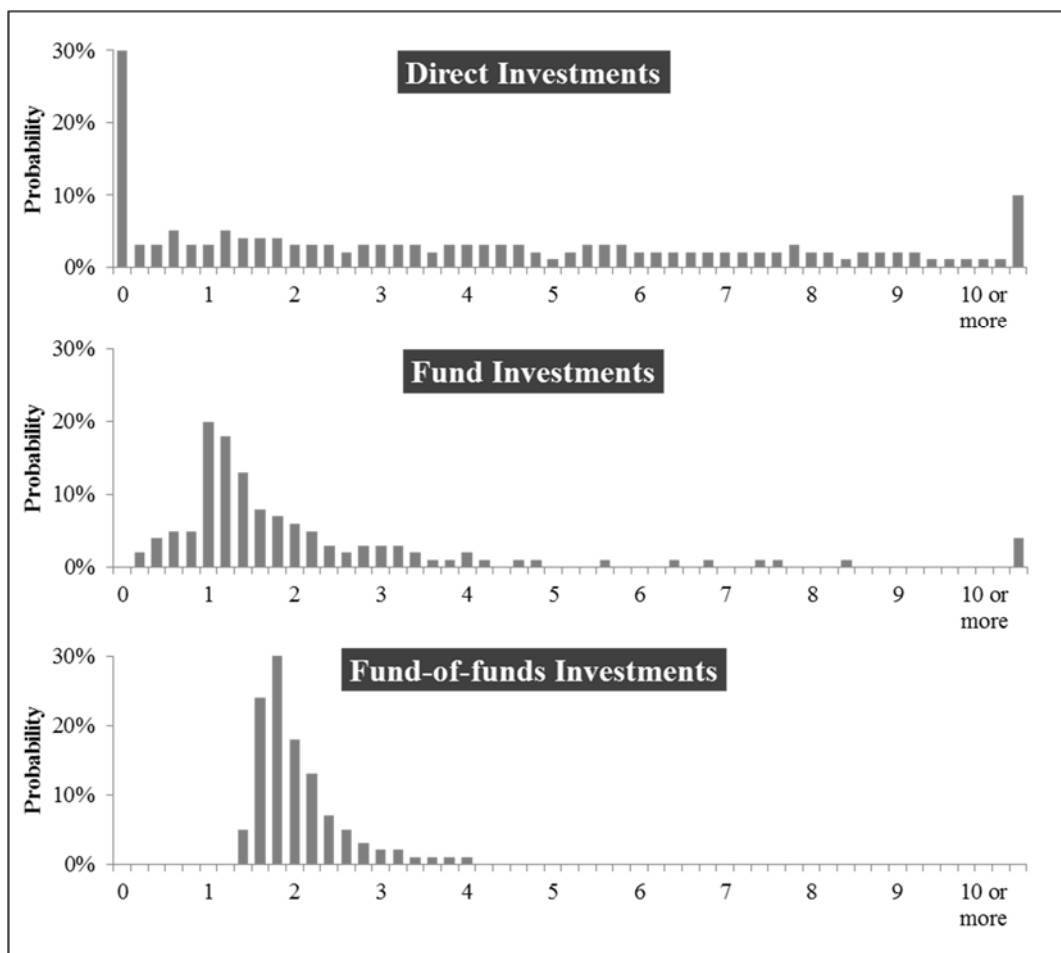


Figure 3-2: Return Distributions of Direct, Fund and Fund-of-Funds Investments¹⁹³

3.1.3 Data Sources for Venture Capital Return Analysis

After having introduced the fundamentals of VC performance, i.e. the relevant performance measures (chapter 3.1.1) as well as major return characteristics (chapter 3.1.2) this chapter introduces prevailing challenges to any qualitative as well as quantitative analysis of VC performance. The most important sources for private equity data are introduced and their applicability for private equity research shortly discussed. Although systematic research on VC began as early as in the 1970s and expanded substantially in the following three decades¹⁹⁴, researchers

¹⁹³ Source: Based on Weidig and Mathonet (2004), pp. 10, 14, 17.

¹⁹⁴ Cf. Landström (2007), p. 3; in his *Handbook of Research on Venture Capital* LANDSTRÖM provides a comprehensive overview of the current status-quo of VC research.

in the field are still confronted with major challenges. The following section presents these challenges.

Data availability, i.e. the collection of appropriate data, remains the most important key challenge of VC research. In strong contrast to the comprehensive stream of literature on public equity, research on private equity has always suffered from limited access to comprehensive, large-scale data.¹⁹⁵ As of today, the true performance of VC firms remains largely concealed: “(...) it may seem surprisingly that there are only a few papers analyzing the returns of VC. However, an analysis of the profitability of investments in private equity is no easy task since information within the private equity industry is by definition ‘private’, compared to e.g. public markets, and transparency requirements are limited.”¹⁹⁶ Hence, none of the participating parties (primarily venture capitalists and LPs) have historically been required by regulations to publicly disclose details on their investment activity. As a result, comprehensive databases that provide detailed performance data are hardly available.¹⁹⁷ Merely, an amendment to the so called Freedom of Information Act (FOIA) in the US and UK has more recently been utilized by various parties to force certain public pension funds (who alone are affected by the regime of the FOIA) to disclose parts of the sensitive information which they regularly receive about the private companies in which their GPs invest.¹⁹⁸ As a result of this development several GPs began to drop these pension funds as fundraising partners. Nevertheless, first efforts to aggregate these obligatory reported data, i.e. primarily specific information of LP returns, can be recorded.

Furthermore, the discussion on data availability needs to be held under the previously introduced discussion on return characteristics. Hence, the access to existing performance data varies substantially depending on the respective level of return (deal-level, fund-level or fund-of-funds-level) and accordingly on the question whether gross or net returns are to be analyzed. Subject to these considerations, few databases could be identified that provide access to the respective performance data. Looking at the diversity of historical VC related performance studies, clearly the vast majority is focused on the analysis of fund-level returns as achieved by investors into GPs, i.e. fund-of-funds.

¹⁹⁵ Cf. Da Rin, et al. (2011), p. 6.

¹⁹⁶ Söderblom and Wiklund (2006), p. 15.

¹⁹⁷ Cf. Da Rin, et al. (2011), p. 74.

¹⁹⁸ Cf. Tricks (2005), p. 1.; a summary of legal arguments of this “FOIA” discussion can be found by Robins and Toomey (2003), pp. 1-4.

Performance Measurement

Provider	Thomson Financial	Cambridge Associates	Burgiss	Preqin	Cepres	Dow Jones
Database	VentureExpert	Alternative Assets Investment Manager	Private iQ	Performance Analyst	Private Equity Analyzer	VentureSource
Data Volume	> 2.600 funds <i>1.200 US VC funds</i> <i>500 US buyout funds</i> <i>900 European funds</i>	> 2.100 funds <i>80% of all the VC investments</i> <i>66% of all the buyout investments</i>	> 1.400 funds <i>c. 800 VC funds</i> <i>c. 600 buyout funds</i>	> 4.800 funds	c. 29.300 portfolio companies <i>US: c. 17.400</i> <i>EU: c. 9.300</i> <i>RoW: c. 2.600</i>	67.000 VC-backed companies
Time Period Covered	US: Since 1969 EU: Since 1980	VC: Since 1981 BO: Since 1986	Since 1978	Since 1980	Since 1971	Since 1992
Key Performance Data	Net Cash Flows, IRRs, Return Multiples	Net Cash Flows, IRRs, Return Multiples	Net Cash Flows, IRRs, Return Multiples	IRRs, Return Multiples	Gross Cash Flows, IRRs, Return Multiples	(Interim) Company Valuations
Primary Data Origin	Data voluntarily provided by fund managers and investors (LPs)	Data provided by GPs and LPs that use CA advice to raise capital	Cash flow and fund data from participating LPs. Data provided for record keeping and fund investment	Mostly enforced publications of large institutional investors under reference to the FOIA	Voluntarily reported by GPs	Access to several primary and secondary sources. Systematic process to gather information
← Fund-Level Returns →				← Deal-Level Returns →		

Table 3-1: Sources for Venture Capital Performance Data¹⁹⁹

This research focus is primarily due to the historical availability of data. Hence, existing studies almost exclusively utilize performance data from the VENTUREXPRT (TVE) database provided by the financial data company Thomson Financial.²⁰⁰ As the oldest database, TVE provides a comprehensive data coverage of relevant, fund-level information. Thereby, TVE relies on the voluntary provision of data from VC firms, a fact which has been assessed to be critical from a research perspective. Thereby, the discussion is in particular focused on a potential risk of a data bias within this database.²⁰¹ More recently, this discussion is further promoted by STUCKE. He uses data from TVE and compares the cash flow data for many individual funds

¹⁹⁹ Source: Own extension based on Askar (2008), p. 163; Smith, et al. (2010), pp. 1-52; Harris, et al. (2011), pp. 1-43; Franzoni, et al. (2011), pp. 1-79; CEPRES company information found at www.cepres.com/About.aspx; Burgiss company information found at <http://www.privateiq.com/data/>.

²⁰⁰ STUCKE provides an interesting overview of seminal research that has been published exploiting TVE (Cf. Stucke (2011b), pp. 6-7)

²⁰¹ Kaplan, et al. (2002), p. 2.; Maats, et al. (2011), pp. 32-33

to actual fund data from a single large limited partner (LP). He finds strong evidence that the TVE performance data are “downward biased and, therefore, understate fund returns, particularly for buyout funds”.²⁰² Another critical factor that is frequently mentioned is geographical coverage. Hence, data coverage of the TVE database seems to be considerably better for the US than for other geographical regions. Although, this goes along with the outstanding importance of the US VC market, research results cannot easily be transferred to other geographies. Recent literature on the dependencies from VC investment activity (and resulting investment returns) and a region’s (or more precisely country’s) legal characteristics seems to support this assessment.²⁰³

As a reaction to these critics, researchers recently began to build up and utilize alternative databases to analyze VC or more general PE investment returns. Table 3-1 provides an overview of these databases. Hence, the “Alternative Asset Investment Manager Database” provided by CAMBRIDGE ASSOCIATES (CA) is another interesting source for private equity performance data. As an investment advice company, CA obtains its data through the provision of services to LPs and GPs who have raised or are trying to raise capital.²⁰⁴ Thereby, continuous performance measurement of fund portfolios is a central service of CA. Due to the nature of provided data the database contains aggregated fund-level performance data on a net basis. Although CA provides an interesting data collection approach, critiques say that the CA database “may well have a bias towards GPs who are raising new funds and, therefore, may have performed well”.²⁰⁵ A similar approach to CA to collect a large sample of private equity performance data is pursued by BURGISS. As a private equity consulting company, BURGISS services approximately 300 global clients in the alternative asset sector like pension funds, endowments or family offices. As the company helps his clients to manage investments through all stages of the private equity investment cycle, BURGISS exclusively collects data from a growing group of LPs.²⁰⁶ Only recently, HARRIS ET AL. are the first to provide a comprehensive review of this new database. Accordingly, they identify in particular the data collection process as a promising advantage. Hence, in contrast to the TVE and CA data, the BURGISS database makes

²⁰² Stucke (2011a) quoted by Harris, et al. (2011), p. 1.

²⁰³ See Cumming, et al. (2006), pp. 214-245.

²⁰⁴ For more information see <https://www.cambridgeassociates.com/>.

²⁰⁵ Harris, et al. (2011), p. 6.

²⁰⁶ Cf. company information provided on <http://www.privateiq.com/data/> (found at January 21, 2013).

sure that all funds and the respective cash flows from a single LP are included in the data. This is in contrast to the voluntarily provided data in the TVE and CA databases. Accordingly, for LPs included, “there is unlikely to be a selection bias or problems with data updating. This is an advantage over the other commercial databases whose data rely on voluntary and FOIA disclosures by GPs and LPs.”²⁰⁷ However, considering this argumentation, the BURGESS database suffers from another important pitfall. Hence, its overall representativeness heavily depends on unbiased selection of underlying LPs (respectively resulting GPs). With regard to fund-level net returns, PREQUIN is finally another relatively new data provider. According to company information, PREQUIN obtains its data primarily from public filings by pension funds, from FOIA requests to public pension funds, and although to a limited extent from the voluntary reporting of fund managers. Thereby, the database is primarily filled directly with performance data like fund IRRs and multiples, but does not have the underlying fund cash flows.²⁰⁸ Next to these missing cash flow data, researchers criticize the potential selection bias that is caused from the exclusion of funds that are not funded by public pension funds. The latter could in particular for well performing funds be the case as they can “afford” to actively drop suchlike public investors from their impressive list of fundraising partners.²⁰⁹

Independent from these data reliability discussions, all of these databases allow an analysis of net-level fund returns only. This is due to the nature of collected information. GPs typically strictly prohibit its fund investors, i.e. LPs, to disclose any detailed performance related information. This general reticence is even more pronounced considering deal-level specific information. Besides their contracted reporting requirements with their LPs, GPs are reluctant to release any performance related data on transaction level. Due to the critical importance of current and past performance for the future prosperity of the partnership, GPs are almost obsessed with “keeping their cards close to their chests.”²¹⁰ A non-anonymized disclosure on individual companies in a fund’s portfolio is accordingly assessed to be most damaging to the business interests of a venture capitalist.²¹¹ As a result, to date a very limited number of

²⁰⁷ Harris, et al. (2011), p. 5.

²⁰⁸ Cf. Harris, et al. (2011), p. 6.

²⁰⁹ A prominent sample of this trend was the drop out of the University of California endowment program from the list of financial investors into funds of the highly respected VC firm Sequoia Capital (Cf. Grimes (2003)).

²¹⁰ Kaplan and Schoar (2005), p. 1791.

²¹¹ Cf. Tricks (2005), p. 1.

papers examine *deal-level gross returns* (see chapter 3.1.4). The primary reason is the fact that data that is typically reported in existing commercial databases is not adequate for this kind of analysis. Besides the general unwillingness of GPs to release transaction-related information voluntarily, data access proves difficult for practical reasons as well.²¹² A detailed analysis of factors that positively or negatively influence VC success for single transactions can hardly be analyzed profoundly based on these data only.

In the absent of easily accessible performance data, some researchers yet tried to conduct studies to analyze determinants of individual (not fund-level) investment success. So far, the majority of studies use reported types of exit for single transactions or company valuations at different points in time as proxy for investment success.²¹³ The data for the latter is typically provided by the DowJones' VENTURESOURCE database. However, these studies have not only to deal with the problem that valuations occur infrequently, and often remain completely unreported. Moreover, it is rather difficult to link company valuations to the investment success of individual venture capitalists as concrete information on the level of ownership is typically missing. Finally, they also encounter a conceptual survivorship problem.²¹⁴ According to DA RIN ET AL. "company valuations are only observed when a company raises funds. Yet a company has a greater incentive (and more possibilities) to raise funds when its valuation has increased. For any round-to-round calculation observed returns are therefore likely to be biased upwards relative to true returns."²¹⁵ This is an argument that is further supported by METRICK AND YASUDA. They argue that deal-level focused studies are often restricted to analyze investments that were divested by means of an IPO. As a result, datasets are rather biased and represent only a small fraction of all VC target firms.²¹⁶ In contrast, the approximation of investment success by means of the achieved exit type runs into other difficulties: Hence, although there is assumingly a link between the achieved exit and the financial performance, the true financial return to the venture capitalist can be substantially different in case of e.g. bad market timing (see chapter 5).

²¹² Primary obstacle is the effort that is required to collect and review deal-level related data requires a substantial amount of resources either on the part of the venture capitalist or the database provider. In the absence of these resources, database providers need to focus on the most frequently requested information only.

²¹³ Cf. Kaplan and Schoar (2005); Cochrane (2005).

²¹⁴ Cf. Da Rin, et al. (2011), p. 88.

²¹⁵ Da Rin, et al. (2011), p. 88.

²¹⁶ Cf. Metrick and Yasuda (2011), pp. 13-14.

Resulting, there remain two alternatives to analyze precise deal-level gross returns: Hand-collected survey data and proprietary industry data.²¹⁷ Questionnaire-based data typically allows raising additional, firm-specific data that goes beyond the typically accessible information. Hence, information such as the portfolio company's choice of innovation strategy, contractual data, financial details or human resource related information represents some examples. However, collecting large samples by means of questionnaires is extremely time-consuming and costly. As a result, not only the utilized data sets but consequently also the scope of such studies is typically limited.²¹⁸ Another comparable source for proprietary information is data that is directly provided by industry participants. The single commercially utilized database with such-like characteristics is provided by CEPRES²¹⁹, a joint venture of Frankfurt University and Deutsche Bank. This database is a rare source of deal-level related data (gross returns) and has been established to provide investment level data, i.e. reported cash flows between VC funds and individual portfolio companies. As CEPRES does not benchmark private equity firms to its peer groups, it is assumed that "data accuracy and representativeness is improved as it eliminates incentives to manipulate cash flows or cherry-pick past investments".²²⁰ Critique on CEPRES data is, however, raised with regard to data completeness of other important, transaction specific variables. Hence, a study by ICK reveals that relevant investment stage or geographic information are missing for nearly 50% of its entire CEPRES based sample.²²¹

In order to overcome these serious data selection, data manipulation and missing data obstacles, several researchers began to establish own relationships with LPs in order to build up proprietary databases. The subsequent empirical analysis follows this strategy (see chapters 4 and 5). The applicability of this approach to analyze private equity returns has been proven in previous research. Hence, LJUNGVIST AND RICHARDSON, LERNER ET AL., ACHLEITNER ET AL.

²¹⁷ Cf. Da Rin, et al. (2011), p. 8.

²¹⁸ Cf. Da Rin, et al. (2011), p. 8.

²¹⁹ CEPRES stands originally for the Center of Private Equity Research, a department of the University of Frankfurt that was founded in 2001. Today, CEPRES is an independent company that provides data-driven tools and services to the worldwide private equity community including LPs, GPs and Advisors.

²²⁰ Phalippou and Athanassiou (2012), pp. 118-119.

²²¹ Cf. Ick (2005), p. 9.

and ROBINSON AND SENSOY follow this strategy.²²² The author of this thesis pursues a similar data strategy to provide further insights into important drivers of VC deal-level success.²²³

3.1.4 Expected versus Actual Venture Capital Performance

This chapter gives an overview of theoretical and actual VC returns. The first part provides a theoretical discussion on expected VC returns. Building upon simplified risk and return arguments, this section discusses minimum return requirements of early stage investors. These are substantially higher compared to other investment classes like bonds, obligations or public equity. The second part provides a comprehensive overview of actual VC returns. For that purpose, the most important previous studies on VC performance are shortly introduced and discussed. Once again, the thesis differentiates within this discussion between fund-level net returns and deal-level gross returns.

Ex-ante return requirements

A common VC wisdom says that “professional venture capitalists do not invest in a company until their rising greed overcomes their declining fear”.²²⁴ This means that venture capitalists truly consider investing in a company only whenever the potential return on investment is attractive enough compared to the investment risk. Typically, the ex-ante required rate of return is therefore closely linked to the development stage of the portfolio company. As introduced in chapter 2.1.2 a newly founded company runs through multiple development phases before being divested. As the company matures, the risk of being ultimately unsuccessful shrinks as the likelihood for a successful exit increases (see Figure 2-7). As a result, a venture capitalist requires a lot more financial return from early stage companies compared to more mature businesses. Figure 3-3 provides an indication for this concept. Hence, the required annual return declines from as much as 80% for seed-staged companies to as little as 20% for companies that have substantially matured.

²²² See Ljungqvist and Richardson (2003); Lerner, et al. (2007); Achleitner, et al. (2010); Robinson and Sensoy (2011).

²²³ Although the utilization of the suggested proprietary data mitigates some of the discussed pitfalls, suchlike data still suffers potential biases. Please see chapter 4 and 5 for further information on this topic.

²²⁴ Bygrave, et al. (1999), pp. 309-310.

Corporate Stage	Expected annual return
Seed stage	70-80%
Start-up stage	60-70%
Early stage	40-50%
Expansion stage	30-40%
Later stage	20-30%

Figure 3-3: Expected Returns on VC Equity Investments²²⁵

This sharp drop in expected investment returns primarily reflects the success probabilities of single VC investments. As the company matures, the risk of corporate failing drops significantly which is ultimately considered by investors focusing on different investment stages: “Because risk and reward are closely related, investors believe companies with fully developed products and proven management teams should yield between 35% and 40% on their investment, while those with incomplete products and management teams are expected to bring in 60% annual compounded returns.”²²⁶ Hence, these high rates of return are required so that successful investments ultimately compensate for investment losses from failed investments. As a rule of thumb, the typical VC portfolio end with the following success distribution: Two out of ten investments will make or exceed the target rate of return, two will be total write-offs and the “remaining six will range from the so called ‘living dead’ where the companies never get big enough for a significant harvest to the so called ‘walking wounded’ that need refinancing if they are to have a chance of making it”.²²⁷

High rates of expected returns are further resulting from the procedure how the relevant investment considerations of the venture capitalist are incorporated into the ex-ante performance calculation. Thereby, it is important to note that venture capitalists typically start their own investment analysis with information provided by the financing-seeking entrepreneur. In a next step the venture capitalist builds his own opinion on the future development by means of

²²⁵ Cf. Bygrave, et al. (1999), p. 312; Anshuman, et al. (2012), p. 79.

²²⁶ Rich and Gumpert (1992), p. 130.

²²⁷ Bygrave, et al. (1999), p. 313.

substantial due diligence analysis (see chapter 2.2). At the end of the process, he not only decides whether or not he wants to invest after all, but also on which fundamental valuation of the company. Typically, a venture capitalist takes a much more conservative view on the future of a venture. Entrepreneurs tend to be overly optimistic as they in particular underestimate the possibility of corporate failure and the respective consequences for future cash flows.²²⁸ In order to be more conservative, a venture capitalist has two different options to adjust his original investment assumptions. He could either modify the imperative operational assumptions with regard to revenue or profitability forecasts. Alternatively, he could simply increase his ex-ante cost of capital (i.e. return) requirement which leads to a higher discounting of projected future cash flows. Most of the time, due to reason of simplicity, the latter option is applied. In addition, venture capitalists usually “benefit of having an optimistic entrepreneur who will encourage and motivate employees and other stakeholders as they strive to meet the forecasts.”²²⁹ Finally, high ex-ante costs of capital assumptions do also incorporate compensation considerations of the venture capitalists. Typically, a venture capitalist is not being paid for providing relevant contacts or for the transfer of valuable knowledge throughout the investment period: „[...] since these hard-to-quantify benefits are not explicitly accounted for (...), they tend to get bundled together in the rate of return that the VC uses to construct the deal terms.“²³⁰

Interestingly, a study for the German VC market reveals differing results (see Figure 3-4). More than two-thirds of German early stage-focused investors require a minimum rate of return below 30% IRR. Merely 9% of these investors target an ex-ante investment return of more than 50%. This result could be explained twofold: First, the German early stage investor base comprises several investors that do not exclusively focus on the maximization of returns but on the general promotion of early stage companies.²³¹ Secondly, as the survey was conducted in the first half of 2010, this result could be a snap-shot of the prevailing economic conditions. Impacted by the lasting financial crisis, investors seem to (at least temporarily) have reduced their performance targets.

²²⁸ Cf. Anshuman, et al. (2012), p. 75.

²²⁹ Anshuman, et al. (2012), p. 75.

²³⁰ Anshuman, et al. (2012), p. 75.

²³¹ Part of the sample data is provided by so called “Mittelständische Beteiligungsunternehmen”. These companies are typically closely linked to various federal state banks. Resulting from these relationships, these investment companies are less focused on pure financial return but on general economic prosperity. Resulting, they have typically ex-ante return requirement below regular, independent venture capitalists.

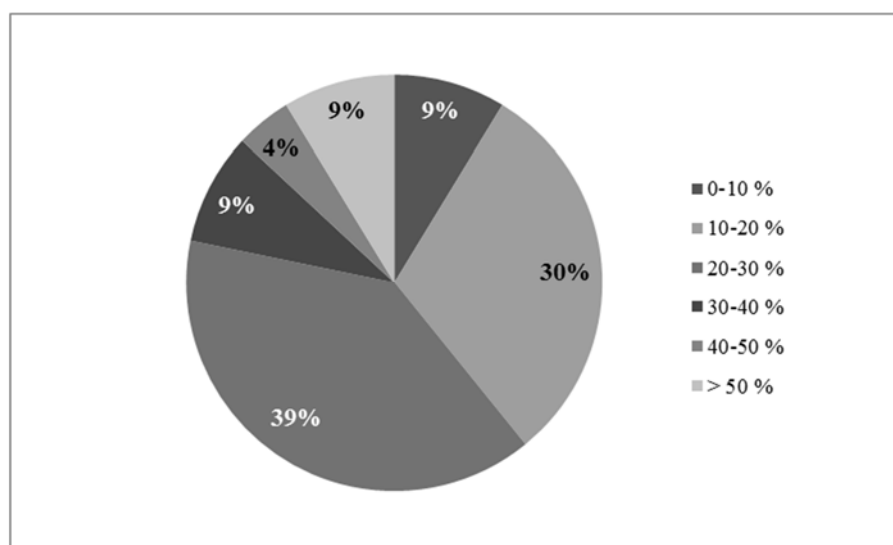


Figure 3-4: VC Minimum Return Requirements²³²

Ex-post VC returns realizations

Before we turn to the analysis of drivers of VC investment returns, this section provides an overview of actual returns that have been achieved in the VC industry. For that purpose existing literature has been screened and the most relevant studies have been selected. Table 3-Table 3-2 provides an overview of included studies that are frequently quoted in VC performance literature. Apparently, returns vary substantially depending on the level of analysis. Hence, results are presented separately for fund-level returns (Panel A) and deal-level returns (Panel B). Results are presented in chronological order. Each of the included studies challenged existing literature at its time, as new data or advanced calculation methodologies were introduced. For all studies the respective author(s), the year of publication, the primary source for performance data, the sample size, the time period covered, the geographical focus as well as the relevant performance measures are presented. Due to severe data limitations, the performance overview focuses exclusively on IRR, showing average and median results of the respective data set. Performance measures are presented equally weighted for both fund-level as well as deal-level results.

²³² Source: Based on Achleitner, et al. (2010), pp. 38.

Performance Measurement

Authors	Year	Primary Data Source	VC Sample Size	Period Covered	Geography	Average IRR	Median IRR	Std. Deviation
Panel A: Fund level focused studies								
Chiampou, Kallett	1989	Proprietary Data	55	1978 - 1989	USA	17,5%	n/a	37,6%
Ljungqvist, Richardson	2003	Proprietary Data	19	1981 - 2001	Global	1,4%	6,6%	90,9%
Kaserer, Diller	2004	VentureXpert	47	1978 - 2002	Europe	7,3%	4,8%	17,8%
Kaplan, Schoar	2005	VentureXpert	577	1980 - 1997	USA	17,0%	11,0%	30,0%
Lerner, Schoar, Wongsunwai	2007	Prequin	134	1991 - 1998	USA	25,6%	14,4%	45,2%
Robinson, Sensoy	2011	Proprietary Data	192	1984 - 2006	Global	9,0%	2,0%	47,0%
Harris, Jenkinson, Kaplan	2011	Burgiss	775	1984 - 2008	USA	16,8%	11,1%	n/a
Hochberg, Rauh	2012	Prequin	4.422	1980 - 2009	USA	11,5%	2,0%	42,9%
Fund-Level Average / Median						11,5% / 11,5%	6,3% / 5,7%	
Panel B: Deal level focused studies								
Hege, Palomino, Schwiendbacher	2003	VentureXpert	381*	1997-2002	Global	407,6%	21,6%	24920,0%
Fleming	2004	Proprietary Data	117	1992 - 2002	Australia	36,4%	22,0%	153,3%
Cochrane	2005	VentureSource	16613*	1987 - 2000	USA	59,0%	n/a	107,0%
Ick	2006	CEPRES	2.685	1975 - 2003	Global	46,0%	18,1%	335,0%
Cumming, Walz	2010	CEPRES	2.419	1971 - 2003	Global	68,8%	17,0%	n/a
Korteweg, Sorensen	2010	VentureSource	5501*	1987 - 2005	USA	95,0%	21,0%	319,0%
Jackson, Bates, Bradford	2011	Proprietary Data	315	1989 - 2006	USA	-19,4%	-0,4%	73,4%
Deal-Level Average / Median						109,5% / 63,9%	16,6% / 19,6%	

* Each observations represents a financing round. IRR is measured as the performance between two consecutive financing rounds

Table 3-2: Overview of Major Quantitative Studies on Historical Venture Capital Performance²³³

²³³ Source: Own illustration. Fund-level information (Panel A) based on Chiampou and Kallett (1989), Ljungqvist and Richardson (2003), Kaserer and Diller (2004b), Kaplan and Schoar (2005), Lerner, et al. (2007), Robinson and Sensoy (2011), Harris, et al. (2011), Hochberg and Rauh (2011); Deal-level information (Panel B) based on Hege, et al. (2003), Fleming (2004), Cochrane (2005), Ick (2005), Cumming and Walz (2010), Korteweg and Sorensen (2010), Jackson, et al. (2011); Average IRR represents the non-value-weighted average of the respective data sample. Studies are presented in chronological order. Some of these studies are not exclusively focused on VC only, but analyzes buyout performance as well. The performance measures presented show the results for VC fund-level respectively VC deal-level only.

The meta-analysis for *fund-level* focused results (net returns) shows an average IRR of 11.5%. With an average return of 15.7% (not shown) returns from studies that exclusively focus on the US substantially outperform the average performance of studies that have a global or pure European focus (5.9%). The average median returns of 6.3% are approximately half the size of the average returns which indicates a bias towards few high performing funds. Looking at the presented studies over time, one can observe that the analyzed universe of accessible fund information continuously increases as data coverage improves through the utilization of more complete or newly introduced sources.

Deal-level performance as presented in Panel B differs substantially from fund-level results. Most obviously, the return distribution is considerably more biased by individual transactions that achieved extremely high returns. As a result, a large delta between an average return of 109.5% and median return of 16.6% can be found within the meta-analysis. Overall, this result confirms the expected return distribution between fund-level and deal-level returns as previously presented in Figure 3-2. The finding is further justified by partly extremely high standard deviations within individual data sets. Another interesting finding is that the performance based on the change of round-to-round valuations (indicated by *) is seemingly higher than results based on actual cash flow data. A reason would be the earlier mentioned positive data bias of these data sets. Apparently, suchlike company valuations are likely to be included only once the company performs well and this way qualifies for additional rounds of financing.

Reflecting on these results, the following results can be noticed. On an absolute level, VC seems to have returned results which are above returns that can typically be achieved from much more conservative asset classes like corporate or state bonds. However, whether these results are to be praised on a risk-adjusted basis can be doubted. First, the data reveals that most attractive returns are apparently returned by a relatively small amount of funds. For that reason, an investor would need to make sure to get access to these frequently quoted “top-quartile” funds. Second, the presented results provide little evidence for the competitiveness of VC compared to other asset classes that are similarly exposed to risk. For that purpose, one would need to have a look at returns that are benchmarked against alternative investment outcomes like the public equity market (see introduction to the PME in chapter 3.1.1). To this regard, HARRIS ET AL. provide the most recent overview for different samples of US VC returns. Benchmarking the respective performance against returns from the S&P 500 equity index, they find a PME of VC for the period between 1984 and 2008 of 1.36. This means that an investor would have

needed to invest 1.36 USD in the S&P compared to 1.00 USD in VC to achieve the same return on investment. This result would mean that VC substantially outperformed the public equity market. However, looking at the results in more detail, the overall result is clearly driven by funds with vintage years in the 1990s (PME of 1.99). For 1980 vintages and for vintages past 2000 the average PME is 0.98 respectively 0.91, which indicates an underperformance for these time periods.²³⁴ For a European sample of fully liquidated VC funds, KASERER AND DILLER find an average PME of merely 0.82 for the period between 1978 and 2002²³⁵; a rather disappointing result from an investor perspective. Finally, the presented results must also be critically outlined against the introduced expected returns. Although, the presented overview of actual returns is not further broken down for different development stages (i.e. early stage versus later stage investments), the average/ median fund-level but also the reported median deal-level returns are significantly below the assumed ex-ante returns (see Figure 3-3). After all, merely the substantially higher average deal-level returns give some credit to the VC asset class: Once, an investor is successful in the participation on highly attractive transactions he can expect returns that match his ex-ante considered return expectations.

²³⁴ Cf. Harris, et al. (2011), p. 32.

²³⁵ Cf. Kaserer and Diller (2004b), p. 48.

3.2 Performance Drivers of Venture Capital Investments

Following the introduction to the concepts of performance measurement in the field of VC, the subsequent section introduces the most relevant factors that determine the performance of VC investments. Thereby, with regard to performance, the focus is clearly on the financial success of the invested venture capitalist. Nevertheless, it is reasonable to assume that the financial success of the VC firm is closely linked to the success of the entrepreneur and the investor, i.e. LPs, of the VC firm. Taking this perspective into consideration, the relevant literature is screened and a comprehensive summary of VC performance drivers assembled. By means of a secondary data analysis the relevant performance factors are identified, introduced and discussed with regard to their general impact on VC investment returns. Thereby, a structured literature research and selection process guarantees that this analysis fulfills the purpose of being (a) comprehensive enough to cover the current status quo of VC performance research and (b) lean enough to provide a pointed overview of the most relevant results. The latter point is indispensable given the great variety of research that has been published in the field of VC in recent years.

3.2.1 Framework to Evaluate Venture Capital Performance Drivers

3.2.1.1 General Framework

The analysis starts with the construction of a simple framework to structure the universe of potential investment success factors. The allocation of performance drivers is thereby strongly influenced by the introduced VC business model (chapter 2.1). Hence, according to Figure 3-5, identified success factors can be attributed to four different areas which, however, dynamically interact in the course of the entire investment period. Thus, investment success can be either related to (1) specific characteristics of the venture capitalist, (2) to specific properties of the portfolio company, (3) to specific contract related factors that regulate the interaction respectively cash flows between the venture capitalist and the portfolio company and (4) to the general market conditions throughout the investment period.

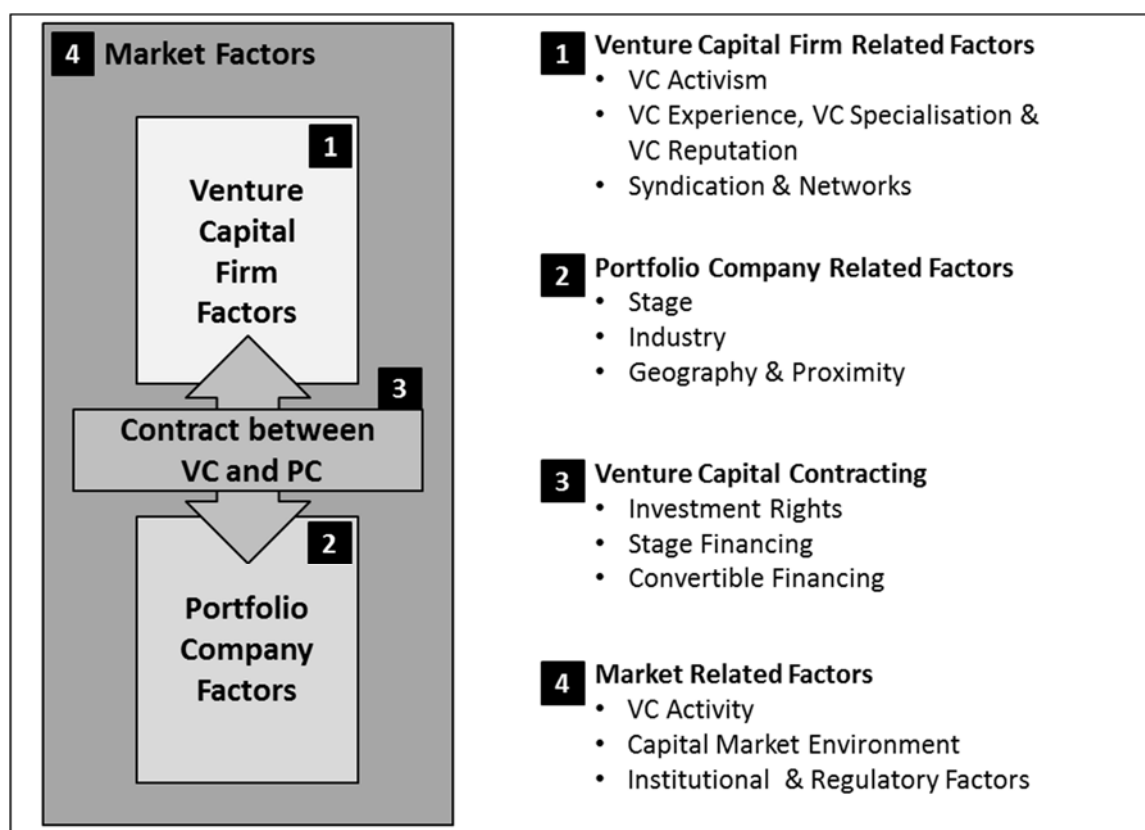


Figure 3-5: Framework of Venture Capital Success Factors²³⁶

Furthermore, one could separate these areas into two broad categories: Areas 1 till 3 can be classified as so called *micro factors*, which directly relate to characteristics of a single transaction, i.e. the venture capitalist, the portfolio company and their contracted investment relationship. The fourth area, in contrast, covers *macro factors*, i.e. factors that affect the general investment environment throughout the deal period. This way, these factors, at least indirectly contribute to the investment performance.²³⁷ Taking these classifications into consideration, the subsequent analysis is meant to provide a holistic picture of empirically tested VC success factors. For that purpose the main findings of seminal VC research on this topic are presented and discussed. Thereby, the focus is on the outline of similarities, differences and synergies.

Initially, it is important to reflect on the definition and effectiveness of a success related factor, i.e. a so called performance driver in the context of this thesis. Performance drivers are

²³⁶ Source: Own illustration; a similar approach to structure research streams on VC performance can be found by Söderblom and Wiklund (2006), pp. 22.

²³⁷ Cf. Söderblom and Wiklund (2006), pp. 21.

the different characteristics of the VC-investment that ultimately determine the financial success of the transaction from the perspective of the venture capitalist. Accordingly, value drivers may be characteristics of the VC, the portfolio company, the relationship between those entities as well as exit- and macroeconomic-related factors. For example, hands-on management support provided by the VC is a typical value-adding activity to help the portfolio company to run their operations more efficiently.²³⁸ Thereby, the success of suchlike activities depends to a large part on the specific management experience and expertise of the VC firm that helps the portfolio company to improve their operations. Another example would be favorable exit market conditions. This could for example be represented by prevailing investor confidence that manifests itself in augmented investor interest to invest in companies that intend to go public for the first time. This kind of condition transfers into VC investment success as the venture capitalist is more capable to achieve attractive financial returns through the ability to accomplish an IPO successfully.²³⁹

Following this approach, two important limitations to the subsequent analysis have to be made in advance. *First*, in line with the set-up of the empirical analysis, this study does not focus on the general existence of a positive influence of VC investments into a company. Hence, the following analysis does not focus on studies that research the question if VC in general adds value. These studies typically compare two groups of companies. Hence, the one group that has received VC financing is compared to companies that have been financed by alternative sources. Thereafter, performance differences between these two groups are compared.²⁴⁰ *Secondly*, beforehand one can in general assume a positive or negative relationship between a specific value driver and the final investment outcome. Typically, however, the expected marginal utility of an increase of the value driver naturally decreases. At some point, an originally positive relationship potentially turns negative. A simple example would be so called monitoring activities by the venture capitalist. Hence, the supervision of the entrepreneur, i.e. the management of the portfolio company, is likely to improve the operational performance as scarce resources are used more efficiently under the guidance of the venture capitalist. However, once the preparation of required reporting documentation for the venture capitalists starts to distract

²³⁸ Cf. e.g. Bottazzi, et al. (2008), p. 489; Achleitner, et al. (2010), p. 47.

²³⁹ Cf. Cumming and Johan (2008b), pp. 1209-1241.

²⁴⁰ See e.g. Hellmann and Puri (2002); Davila, et al. (2003); Florin (2005); Hsu (2006); Fitza, et al. (2009), Rosenbusch, et al. (2012).

valuable management resources (from the entrepreneur) away from the actual development of the company, this activity begins to have a contrary, i.e. negative, impact on the investment. With regard to this matter, the subsequent analysis is designed to provide a general understanding of the relevant value drivers, instead of going into every possible eventuality.

3.2.1.2 Employed Literature

Overall, the empirical landscape on VC related literature on this topic is exceedingly diversified. Hence, studies substantially differ from each other with regard to chosen research designs, the applied empirical methods, the underlying data sets or the definition of relevant variables and performance measures. Moreover, various geographies have been analyzed jointly or separately. Due to the resulting large pool of publications, an appropriate selection is indispensable for the subsequent analysis. Thereby, it is important to avoid an arbitrary selection of relevant studies. To achieve this goal, the focus is on publications that made relevant contribution to the overall research objective and were almost exclusively published in acknowledged research journals.²⁴¹ However, whenever appropriate the discussion is enriched by the inclusion of working papers that only recently began to analyze important relationships through the exploitation of e.g. newly compiled data sets.²⁴²

In addition to these general remarks, the following considerations were applied in order to guarantee a reasonable selection as well as presentation of the relevant research. *First*, the analysis focuses exclusively on studies that examine the impact of specific value drivers throughout the investment period of the venture capitalist. Hence, studies that analyze the corporate performance of VC portfolio companies after an actual exit event are not included. In any event, most of these studies fall into the category of papers that analyze the general impact of VC financing (see above). This limitation is consistent with the focus on studies that provide results for investment success on the VC level. Hence, this thesis assumes the process of value driving from the perspective of the VC and its investment to be completed once the portfolio company is fully divested. Any value increase that is achieved beyond that point, i.e. value that is generated for the new shareholders, is therefore of limited interest.

²⁴¹ As the result of this procedure the selected studies are almost exclusively written in English and tend to be focused on the US VC market. However, as the own empirical analysis is likewise dominated by US data this actuality increases the overall comparability of results within this thesis.

²⁴² The major relevant databases have been introduced in chapter 3.1.3.

Secondly, as previously indicated the focus is on drivers that influence the single transactions success of the venture capitalist. Hence, whenever possible, studies that focus on the performance of individual transactions take center stage and are discussed in detail. However, as previously discussed, data on single transaction level has been very limited to date; merely a handful of relevant studies could be identified. Resulting from this fact, studies that discuss the relationship between specific value drivers and the performance of entire VC funds are selectively discussed as well.

Third, studies that utilize actual financial performance measures (as presented in chapter 3.1.1) are preferred over examinations that proxy investment success by means of the achieved exit type or e.g. other company related performance indicators like revenue growth, increase in number of employees or whether the company secured next round financing after all. As a result, not all studies are necessarily discussed with the same level of intensity, placing the emphasis on studies with the highest impact on VC performance research.

Fourth, the presented results focus on the main research objectives and results of the individual studies. Frequently, however, a study does not exclusively focus on a single research questions but intends to confirm multiple hypotheses at a time. As indicated, the overview focuses on the major contribution to literature. Resulting, for the presented analysis, each selected study is integrated into the own framework where most appropriate and according to the major focus of the respective study.

Fifth, it should be mentioned that the following subsections are not entirely exclusive as the dependency between some of the value drivers is sometimes not entirely clear. A good example is the relationship between three value drivers that are typically related to the venture capitalist: experience, knowledge and reputation. At first glance, reputation should be gained by knowledgeable venture capitalists as they ramp up experience from the completion of successful deals. Alternatively, however, one could argue that reputation could also follow from luck and does not necessarily require specific knowledge. To mitigate suchlike problems, within the subsequent analysis, it is attempted to discuss individual performance factors as independent as possible. However, if certain relationships cannot mutually exclusively be discussed, the interaction of certain drivers is adequately presented.

The subsequent introduction of relevant performance drivers follows a consistent structure. Hence, the relevant drivers are first of all introduced and its “mode of action” in the context of

VC investing delineated. Thereby, the relevant theoretical fundament is shortly presented. Subsequently, the general impact of the factor is analyzed by means of looking at the relevant literature under consideration of the previously mentioned limitations. For that purpose, the major results and contributions to existing literature for each of the included papers is presented: Whenever appropriate relevant peculiarities with regard to e.g. the applied fundamental theories, the utilized data samples or differing variable definitions are discussed. Less attention is devoted to detailed statistical methods. Common obstacles and limitations of these studies are jointly discussed at the end of this analysis (chapter 3.2.6).

3.2.2 VC Firm-Related Success Factors

Considering the four identified areas of value driving activities, the venture capitalist related performance drivers are certainly the ones that attracted the most attention by previous research. This is assumingly attributed to the way how success is predominantly perceived within the VC industry. Building upon the result of a study by KAPLAN AND SCHOAR, there is a common wisdom within the entire private equity industry on strong performance persistence.²⁴³ As a result, industry observers typically assume that knowledge, experience or network abilities are important VC firm related factors that guarantee ongoing investment success. For that reason these factors play an important role not only in the capital allocation process of VC fund investors but also in the selection process of finance-seeking entrepreneurs.

As previously mentioned, one important feature of VC is that compared to other types of financing venture capitalists do more than the mere provision of capital. As active investors, they use their resources to support the companies they are investing in.²⁴⁴ Ultimate goal of these activities is to increase the value of the portfolio company and subsequently the investment return of the venture capitalist and their investors. Thereby, value is typically created through the close interaction with the management of the portfolio company. Potential activities of the venture capitalist are manifold and can be categorized in terms of pre- and post-investment activities. In line with the previously introduced VC investment process (chapter 2.2) pre-investment activities include all tasks up to the beginning of the development phase, which begins

²⁴³ Cf. Kaplan and Schoar (2005), pp. 1791-1823; most recent publications begin to challenge this widely accepted view on performance persistence (Phalippou (2010)).

²⁴⁴ Cf. Gorman and Sahlman (1989), pp. 236-241; Lerner (1995), pp. 301-303; Sapienza, et al. (1996), pp. 443-446.

after the signing of an investment contract. Post-investment activities include all tasks after the contracting stage.²⁴⁵

Historically, several researchers have already pursued the goal to categorize value adding activities and roles of venture capital investors. Thereby, the allocation of a large variety of value adding initiatives into a reasonable amount of aggregated categories is one of the key challenges. Early work by MACMILLAN ET AL. discusses 20 different value-adding activities.²⁴⁶ More recently, BOUÉ lists up to 33 different value-adding initiatives reaching from “Participation in the definition of a business strategy” to “Investor as mentor or coach”.²⁴⁷ Just like the number of activities grew over time, the number of categories increased as well. Thus, SAPIENZA AND TIMMONS originally differentiated between the three categories of (i) strategic value added, (ii) social or supportive value added, and (iii) networking value added.²⁴⁸ Due to criticism of being not mutual exclusive and partly to vague, BRINKROLF introduced two additional categories: (i) strategy, (ii) finance, (iii) organization and operations, (iv) network and cooperation, and (v) personnel.²⁴⁹ BOUÉ, finally, further increased the theoretical fundament of value-adding activities. According to his model, there exists a total of 8 different value-adding vehicles that serve as aggregated categories of value add as provided by venture capitalists: (1) monitoring/ controlling, (2) advice, (3) information, (4) network/ contacts, (5) coaching / motivation / sparring, (6) risk reduction, (7) planning certainty, and (8) positive branding.²⁵⁰ The latter three are marked as so called passive vehicles, whereas the first five vehicles are actively provided by the venture capitalist. Taking this previous work into account, the subsequent analysis discusses VC firm related value drivers of investment performance by means of the following three aggregated categories: Activism, Experience & Specialization & Reputation, Networks & Syndication.²⁵¹ In the eye of the author, these categories are both, sufficiently aggregated and detailed to comprehensively discuss venture capitalist-related performance factors.

²⁴⁵ See among others Sapienza and Timmons (1989); Brinkrolf (2002); Cumming, et al. (2005b); Boué (2007).

²⁴⁶ Cf. MacMillan, et al. (1989), p. 28 and p. 36.

²⁴⁷ Cf. Boué (2007), p. 15.

²⁴⁸ Cf. Sapienza and Timmons (1989), pp. 74-78.

²⁴⁹ Cf. Brinkrolf (2002), p. 90.

²⁵⁰ Cf. Boué (2007), pp. 26 ff.

²⁵¹ Due to the focus of this thesis on independent venture capitalists the organizational form of the VC firm is not part of the subsequent overview. Hence, studies that focus on performance differences among private, public, governmental or corporate venture capitalist are not discussed. For more information see among others Gompers

In addition, these categories best match the research focus of relevant studies on VC performance. Subsequently, the impact of each of these categories on VC investment success is separately discussed.

3.2.2.1 VC Activism

VC activism is directly linked to the introduced term of “hands-on” investment style that is typically pursued by VC firms. Accordingly, the active intervention in the regular business activities of the own portfolio company is a defining character of this asset class.²⁵² GORMAN AND SAHLMAN report that venture capitalists typically spend approximately 60% of their time managing their investments, whereas the screening of new investments and other administration consumes the remaining balance.²⁵³ In this context, activism means primarily the quantity of work and time dedicated by the venture capitalist to coach the portfolio company. To empirically analyze the success of this activism is however difficult. According to BOTTAZZI ET AL. the measurement of investor activism remains an empirical challenge: “Investors’ activities are largely (...) not specified in contracts, nor are they recorded in standard sources of venture capital data.”²⁵⁴ As a result, there is only a limited amount of studies that focus on this particular relationship. Most of this research falls back on questionnaires to collect the respective data. From a theoretical perspective, these studies discuss classical agency theory as well as asymmetric information theory related arguments. Accordingly, “agency risk gives rise to the venture capitalist’s governance with a need to monitor the activities of the ventures to ensure that the management’s behavior is in line with the interests of the venture capitalist”.²⁵⁵ Furthermore, frequent interaction with the portfolio company, i.e. the strategic monitoring of the management, significantly reduces the amount of asymmetric information between the two entities.

In their analysis of VC activism JACKSON ET AL. hence focus on this trade-off decision that a VC fund manager typically faces when advising portfolio companies: The critical issue is that “as the number of assisted firms expands, advice can be stretched too thin, reducing portfolio

and Lerner (2000a); Lerner (2002b); Leleux and Surlemont (2003); Dushnitsky and Lenox (2006); Ivanov and Xie (2010).

²⁵² Cf. Sapienza (1992), pp. 9-10; Wright and Robbie (1998), pp. 525-526; Hellmann and Puri (2002), pp. 169-170.

²⁵³ Cf. Gorman and Sahlman (1989), p. 235.

²⁵⁴ Bottazzi, et al. (2008), p. 489.

²⁵⁵ Jääskeläinen, et al. (2006), p. 187.

company prospects”.²⁵⁶ In their study, they measure VC activism by means of four different instruments: (1) advising on long-term planning, (2) active involvement in exit strategy, (3) assisting with personnel hiring, and (4) support in day-to-day operations. The empirical results indicate that VC activism does predict higher investment returns, i.e. that there is an overall positive relationship between the level of VC activism and financial success. However, the study also documents that the investment success is partly put at risk as growing portfolio sizes tend to overextend scarce VC resources.²⁵⁷ JÄÄSKELÄINEN ET AL. find similar results as they research how “the attention allocated by venture capitalists to portfolio companies impacts their ultimate investment performance”.²⁵⁸ Thereby, the authors develop arguments for an optimal portfolio strategy with regards to the size of the portfolio; the limitations of venture capitalists’ involvement considering the nature of interpersonal and informational factors of their assistance and governance are explored. Activism is approximated through the fraction of partners in each VC firm to the number of total portfolio companies. Overall, their results suggest that there exists an optimal portfolio size with respect to the number of companies per partner.²⁵⁹ Interestingly, this means that VC investments cannot be seen as independent investment events from the perspective of the venture capitalist. In contrast, the existence of an optimal number of portfolio companies (relative to the number of managing partners) “demonstrates that with a large enough portfolio, the marginal return on each additional portfolio company turns negative”.²⁶⁰ The authors conclude that the fund performance is ultimately driven by each single investment. Consequently, the venture capitalist is required to carefully consider the size of his investment portfolio.

Finally, using a hand-collected sample of European venture capital deals BOTTAZZI ET AL. examine the determinants and consequences of investor activism for the European venture capital market. Their study shows that VC firms with partners that have prior business experience demonstrate the highest degree of activity. To approximate the level of activism the authors utilize similar measures as JACKSON ET AL.: (i) involvement with management recruiting, (ii)

²⁵⁶ Jackson, et al. (2011), p. 1.

²⁵⁷ Cf. Jackson, et al. (2011), p. 12.; Similar results are reported by Cumming and Dai (2010). Additional theoretical arguments on the optimal relationship between VC portfolio size and performance can be found by Kannianen and Keuschnigg (2003) and Fulghieri and Sevilir (2009).

²⁵⁸ Jääskeläinen, et al. (2006), p. 201.

²⁵⁹ Cf. Jääskeläinen, et al. (2006), p. 201.

²⁶⁰ Jääskeläinen, et al. (2006), p. 201.

the assembling of the company's board of directors, (iii) assistance with obtaining additional financing, and (iv) the level of interaction with the portfolio company.²⁶¹ With their study BOTTAZZI ET AL. provide answers to two important questions for the VC industry: (i) what characteristics of the venture capitalist cause a more active investment style, and (ii) whether investor activism results in superior investment performance. They find that investor activism is positively related to the ultimate success of portfolio companies.²⁶² Nevertheless, the authors suggest interpreting their results with care: Just hiring partners with prior industry experience and related potential of additional investor activism falls short of being a promising strategy. They rather suggest interpreting their finding "as an economic equilibrium outcome, where talented venture capitalists with prior business experience are a scarce but valuable resource".²⁶³

3.2.2.2 VC Experience, Specialization & Reputation

BOTTAZZI ET AL. provide also first evidence that the experience of the venture capitalist is another important value driver. Most fundamentally experience, thereby, stems from the frequent repetition of the typically VC related activities, i.e. from making more deals. Related to experience, specialization, i.e. to focal one's investment activity on specific industries or corporate stages, is another frequently discussed success factor. Building upon both experience and specialization, reputation is a third driver that is closely linked to the characteristic of the investing venture capitalist. The latter largely stems from previously successfully exited investments. Due to their close relationship, these three characteristics and their impact on venture capital success are jointly discussed in the following.

With regard to *experience*, organizational theory typically differentiates among people-related as well as firm-related experience. People-related experience is closely linked to the human capital of the VC firm, i.e. the skills, knowledge and experience of the relevant key personnel. This type of experience is substantially driven by the personal education and the individual experience in the VC industry as well as in other relevant industries, and therefore contributes to the explicit and implicit knowledge of the venture capitalist. Firm-related experience is, in contrast, often approximated by the years the VC firm already exists or the number of deals it has already completed. This way, it represents a sort of measurement on how good the

²⁶¹ Cf. Bottazzi, et al. (2008), p. 489.

²⁶² Cf. Bottazzi, et al. (2008), p. 488.

²⁶³ Bottazzi, et al. (2008), p. 490.

personnel resources interact in their daily investment routines, on how well prior deal experience is documented by means of comprehensive databases or on how efficiently formal investment procedures contribute to the overall success of the VC firm. Additionally, firm-level experience is often perceived differently to personal experience from outsiders such as fund investors or entrepreneurs of potential portfolio companies. It is more visible and has a larger impact on the outside perception, having a significant impact on the access to deal flow and fundraising.

In a comprehensive, empirical study for the US VC market SORENSEN confirms these predictions.²⁶⁴ His study finds that companies with experienced investors are more likely to go public. According to the author, this follows both from the influence of the invested venture capitalists and from sorting in the market. Thereby, influence means that experienced investors add more value than inexperienced investors. Sorting, on the other hand, means that experienced investors invest in companies that are inherently better, and hence are associated with higher IPO rates.²⁶⁵ For both influence and sorting, results are found to be significant. GOMPERS ET AL. extend this analysis and examine specific characteristics of the funded entrepreneur. They find that there is only a performance differential between more and less experienced venture capitalists when they invest in companies started by first-time entrepreneurs or those who previously failed.²⁶⁶ If, in contrast, the funded portfolio company has been started by an entrepreneur with a successful track record, then the probability of the portfolio company to succeed is not significantly higher. As a result, the authors carefully conclude that “previously successful entrepreneurs derive [limited] benefits from the value-added services of more experienced venture capital firms: successful entrepreneurs apparently know what they’re doing”.²⁶⁷ This result supports the second argument of SORENSEN. Superior performance of experienced venture capitalists primarily seems to be a result from better selection skills: “More experienced venture capital firms only have higher success rates when they invest in unproven entrepreneurs, a fact which highlights the role suppliers of venture capital play in identifying skilled entrepreneurs

²⁶⁴ Cf. Sorensen (2007), pp. 2725-2762; In the absence of specific return measures, Sorensen uses the ultimate type of exit as a proxy for investment success.

²⁶⁵ Cf. Sorensen (2007), p. 2725.

²⁶⁶ Cf. Gompers, et al. (2006), p. 1-2.

²⁶⁷ Gompers, et al. (2006), p. 2.

and helping them to succeed.”²⁶⁸ Turning towards fund-level IRRs, they find that more experienced VC firms are predicted to have fund-level IRRs of 45.4%, as compared to 14.3% for less experienced venture capital firms. Another study by GOMPERS ET AL. studies the role of VC experience against the background of substantial volatility of the VC industry. Looking at the investment result from 13.785 companies and their invested venture capitalists, the authors find that in particular experienced, more precisely industry-experienced, venture capitalist extend their investment activities in times of increased capital market activity: “(...) venture capitalists with the most industry experience increase their investments the most when public market signals become more favorable. Their reaction to an increase is greater than the reaction of venture capital organizations with relatively little industry experience and those with considerable experience but in other industries.”²⁶⁹ Interestingly, the increase in investment activity by more experienced venture capitalists shows, however, no adverse impact on the general success of these transactions. One can conclude from this finding that experience at least “protects” an investor from irrational and ultimately often unsuccessful investment activities during e.g. boom periods as seen at the end of the 1990s.

The latter finding is closely tight to the discussion on VC *specialization*. According to GOMPERS ET AL. VC specialization occurs on both firm-level as well as the level of the single venture capitalist. Following their argumentation, one can allocate a VC firm’s strategy with regard to specialization on a 2-by-2 matrix. Hence, on VC firm-level certain venture capitalists specialize in making investments in a particular industry only, while other venture capitalists pursue a more generalist tactic, i.e. they spread their investment activity across multiple industries (and/or stages). Similarly, on a people-related basis some of these generalist firms are comprised of venture capitalists who are themselves generalists, while others are comprised of a diversified group of industry specialists.²⁷⁰ BENDER contributes to this discussion and identifies two relevant arguments for specialization strategies in the VC industry. Firstly, the focus on specific sectors is important in order to drive an efficient investment process building upon the familiarity with the industry and/or technology. This is even more important as venture capitalists have only a limited amount of personnel and time. As a result, they can only “accumulate

²⁶⁸ Gompers, et al. (2006), pp. 2-3.

²⁶⁹ Gompers, et al. (2008), p. 1.

²⁷⁰ Cf. Gompers, et al. (2009), p. 818

expert knowledge and relevant networks in a [narrow] number of technologies and industries”.²⁷¹ Secondly, venture capitalists allocate their limited funds only into the most promising sectors. Hence, due to different growth perspectives of industries, venture capitalists decide carefully on the selection of their targeted industries and technologies.²⁷² From an empirical perspective, specialization is typically measured by means of Herfindahl-Hirschman-Indices. These measures calculate the distribution of previous investments among different industries or stages.²⁷³ Thus, a firm with a Herfindahl score of 1 has invested in only one of the respective industries or stages.

DE CLERCQ AND DIMOV argue in line with previous literature that investing in familiar industries provides venture capitalists with a “better understanding of the complexities of their current investments and therefore enables them to develop their portfolio companies better”.²⁷⁴ This is achieved as knowledgeable venture capitalists are more efficient in identifying and dealing with key industry stakeholders (e.g. customers, suppliers, management recruiting firms) and have a better understanding of the strategic and operational decisions in those industries.²⁷⁵ Ultimately, their study finds that the likelihood of a successful investment exit increases significantly with the number of previous deals that the venture capitalist has made in the same industry. More precisely, they find that one prior investment in the same industry increased the investment’s probability to achieve an IPO exit from 12.5% to 13.2% and of an acquisition exit from 23.1% to 23.8%. Due to the effect of diminishing marginal utility of an ever increasing number of deals, the study reports for ten prior investments an increase in IPO probability to 15.0% and in acquisition probability to 25.5%.

Another study by DIMOV AND DE CLERCQ analyzes the importance of expertise in the context of venture failure. This way, the thesis is less focused on analyzing whether specialization increases the likelihood to complete successful investments but rather whether specialization

²⁷¹ Bender (2010), p. 27.

²⁷² Cf. Bender (2010), p. 27; Tyebjee and Bruno (1984), p. 1057; de Clercq and Sapienza (2001), pp. 45-46.

²⁷³ The Herfindahl-Hirschman-Score is the sum of the squares of the percentage of all previous in each industry/stage; Compared with industry knowledge, stage knowledge is harder to assess and measure; even if a venture capitalist focuses on specific stages, he typically gets exposed (and thus learns from) all subsequent development stages as the companies in its portfolio mature and prepare for an exit (cf. De Clercq and Dimov (2007), p. 609)

²⁷⁴ De Clercq and Dimov (2007), p. 588

²⁷⁵ Cf. Gupta and Sapienza (1992), pp. 359-360; De Clercq and Dimov (2007), p. 588.

helps to avoid unsuccessful investments. Their results suggest that “new ventures will be less likely to fail when the [venture capitalists] hold expertise that is particularly relevant to the context of their investments”.²⁷⁶ Accordingly, expertise that the venture capitalist develops over time through specializing on specific topics seems to have an impact on the sustainability of the developed business model. As a result, venture capitalists are well advised to be selective by investing in portfolio companies. The focus should clearly be on ventures that qualify the most to benefit from the operational as well as industrial knowledge of the venture capitalist.²⁷⁷ Hence, specialization is a powerful tool to increase the overall investment efficiency and leads to better investment outcomes: “This assimilation of skills allows the venture capitalist to better understand the needs of its current and future portfolio companies.”²⁷⁸

GOMPERS ET AL. add another dimension to the theory of specialization in the VC industry. Building upon strategic considerations by STEIN, they try to simultaneously answer two different questions: (1) How does specialization affect the quality of capital allocation across industries, and (2) how does the degree of specialization affect the performance of investments within an industry.²⁷⁹ The study finds that specialized venture capitalists perform better than their less-focused counterparts. This outperformance is observed for both, a specialized VC firm that focuses exclusively on specific industries (although the individual investment manager have a more general background) and for a general VC firms whose investment professional are yet highly specialized individuals. The authors conclude that “specialization increases the likelihood that a venture capital firm spots good industries in which to invest, and make good investments within those industries”.²⁸⁰ This is a remarkable result considering the increased speed how industry outlooks can change these days. As a result, the “opportunity window” to invest in new technologies or industries is typically limited to few years or even several months.²⁸¹

²⁷⁶ Dimov and De Clercq (2006), p. 219.

²⁷⁷ Cf. Dimov and De Clercq (2006), p. 219.

²⁷⁸ Dimov and De Clercq (2006), p. 219.

²⁷⁹ Cf. Stein (1997), pp. 111-112; Gompers, et al. (2009), p. 818.

²⁸⁰ Gompers, et al. (2009), p. 818.

²⁸¹ This requirement follows the general trend of ever shorter development and product cycles (in particular in consumer-related industries). As a result, the available time for active investors like venture capitalists to select, develop and grow standard-setting companies within new industries shrinks steadily which overall reduces the margin for failure. This trend is further pronounced as the capital intensity of specific growth industries, like the web-based industry, decreases substantially. As it allows more companies to be active in these areas, the competition in suchlike industries is typically substantially intensified.

The study results suggest that VC firms in order to remain successful are obliged to not only continuously identify the most promising industries, respectively technologies, but also develop the relevant knowledge and experience to capitalize on it. The recruitment of key personnel, therefore, seems to be of crucial importance.

Finally, CUMMING ET AL. introduce the concept of style drifting to this discussion on VC specialization. Thereby, style drifting, which means a change to the originally pursued investment strategy, is discussed with regard to the development stage of the portfolio company.²⁸² Accordingly, a venture capitalist “commits” a style drift if he enters into a transaction where the corporate stage of the portfolio company does not match the reported investment focus of the venture capitalist. Hence, an example represents a seed fund that invests into a company (already) at the expansion stage or reversely if a later stage focused VC firm invests at a very early stage.²⁸³ Reflecting on the previous discussion, a style drift simply represents a strategic move towards less specialization. In contrast to the previously introduced result, CUMMING ET AL. find a rather positive relationship between style drifts and investment performance. Building upon a comprehensive sample from the TVE database, they show that stage drifts are associated with a 4% increase in the probability of an IPO exit. Given the risk of losing one’s investor confidence, the authors assume that venture capitalists tend to style drift only if there is a high likelihood of favorable returns.²⁸⁴ In addition to these performance implications, the study finds that venture capitalists tend to change their investment habits less frequently in times of overall high market activity like the internet bubble years. This result seems to indicate a certain investment pressure due to competition in the VC industry. Hence, in times where there is a limited amount of activity, i.e. interesting investment opportunities, VC firms tend to relax their investment focus in order to participate in the few promising opportunities available. Similarly, young venture capitalist tend to be less eager to invest outside of their original investment focus as they face a higher risk from losing reputation due to premature investment decisions. A recent working paper by SMITH ET AL. contributes to this discussion. They find weak evidence

²⁸² Cf. Cumming, et al. (2009), pp. 11-12.

²⁸³ CUMMING, DOUGLAS ET AL. discuss also the opportunity of a potential style drift with regard to industries and geographies. However, due to severe data limitations they cannot test the impact of style drifts for these categories. Asked for the relevance of suchlike style drifts for their capital allocation decisions, relevant institutional investors, however, reveal that drifting with regard to corporate stages seems substantially more important than with regard to industry or geography.

²⁸⁴ Cf. Cumming, et al. (2009), p. 21.

that sector “agility”, i.e. the flexibility with regard to the industry focus, is similarly related to overall better fund performance.²⁸⁵

Experience and specialization are closely linked to another frequently mentioned value driver: *reputation*. According to NAHATA, reputation is diligently built upon experience, ability, and past performance.²⁸⁶ The value-adding role of reputation is further suggested by early work from MEGGINSON AND WEISS. They argue that venture capitalists fulfill an important certification role.²⁸⁷ Based on their certification model, reputation serves to communicate unobservable qualities about the portfolio company to third parties. This increases the market value of the portfolio company and thus generates rents especially as the information between the portfolio company and the investor is asymmetric.²⁸⁸ In summary, these arguments predict a positive relationship between the experience and reputation of a venture capitalist and the performance of his investments.

From an empirical perspective the measurement of reputation represents a meaningful challenge. Consequently, several different quantitative measures have been utilized. Hence, FERNHABER AND MCDUGALL-COVIN develop a multi-item scale that considers prior experience, performance and visibility of the venture capitalist.²⁸⁹ Due to the distinguished perception of successful IPO exits, several studies use a modified IPO measure to proxy reputation. Thus, the number of IPOs achieved, the IPO capitalization share²⁹⁰, or the ratio of achieved IPOs to total number of portfolio companies can be found in literature.²⁹¹ Other measures include the venture capitalists’ total amount of funds raised and/or invested assuming that new funds are primarily allocated to the most reputable venture capitalists.²⁹² The most accurate measure is obtained

²⁸⁵ Cf. Smith, et al. (2010b), p. 21.

²⁸⁶ Cf. Nahata (2008), p. 128.

²⁸⁷ Cf. Megginson and Weiss (1991), pp. 879-903.

²⁸⁸ Cf. Shapiro (1983), pp. 671-674; Megginson and Weiss (1991), pp. 900ff.

²⁸⁹ Cf. Fernhaber and McDougall-Covin (2009), p. 283.

²⁹⁰ IPO capitalization share is based on the cumulative market capitalization of IPOs backed by the venture capitalist compared to all VC-backed IPOs.

²⁹¹ Cf. Chang (2004), pp. 721-741; Lee and Wahal (2004), pp. 375-407; Hsu (2006), pp. 204-219; Nahata (2008), pp. 127-151.

²⁹² Cf. Gulati and Higgins (2002), pp. 127-144; Chang (2004), pp. 721-741; Nahata (2008), pp. 127-151.

when industry affiliates are directly asked for their perception of a venture capitalists' reputation (typically by means of a questionnaire or survey).²⁹³

In his study, HSU finds evidence for a value-adding influence of VC reputation. Hence, he identifies two different positive factors. First, financing offers made by highly reputable venture capitalists are three times more likely to be accepted by entrepreneurs. This way, reputation seems to significantly support the venture capitalists' sorting activities which should ultimately allow him to gain access to the most promising, i.e. successful, investments. Second, the study finds that high-reputation venture capitalists acquire their shareholding at a sizable discount of 10–14%.²⁹⁴ The latter result is similar to ACHLEITNER ET AL who find that more experienced buyout investors are able to negotiate lower entry prices when they invest into mature companies.²⁹⁵ Interestingly, this empirical finding suggests that “entrepreneurs are willing to forego offers with higher valuations in order to affiliate with more reputable venture capitalists.”²⁹⁶ The authors conclude that the existence of differing entry prices implies that the reputation of the venture capitalist, respectively the attached information network and certification capability, as an “extra-financial” function of the venture capitalist which ultimately allows maximizing investment returns. Additionally, this finding seems of particular interest in times where sufficient VC funding is available to new ventures, i.e. during boom periods like the technology bubble at the end of the 1990s.²⁹⁷

Another landmark study on the relationship between VC reputation and investment success is provided by NAHATA. Based on a sample of 12.124 portfolio companies (all VC firms headquartered in the US), the author finds that reputation contributes in three different ways positively to the single investment success. First, the study finds that portfolio companies backed by more reputable VCs are more likely to exit successfully.²⁹⁸ In the absence of a precise return measure, the study finds that the likelihood that the investment is divested by means of an IPO or an acquisition is significantly higher for reputable venture capitalists. This result endures even within a restricted sample of successful exits: “Thus, a monotonic pattern emerges in

²⁹³ Cf. Hsu (2004), pp. 1805-1844.

²⁹⁴ Cf. Hsu (2004), pp. 1805.

²⁹⁵ Cf. Achleitner, et al. (2011), p. 146.

²⁹⁶ Hsu (2004), pp. 1807.

²⁹⁷ Cf. Hsu (2004), p. 1806

²⁹⁸ Cf. Nahata (2008), p. 127.

which top brand VCs are more likely to be associated with IPOs, followed by medium brand VCs with acquisitions, and the least reputable VCs with unsuccessful exits.”²⁹⁹ Second, the data reveals that reputable venture capitalists are capable to reduce the time to exit, i.e. reduce their average holding periods. Third, the study finds that ventures backed by reputable investors demonstrate a higher efficiency by which the company converts its assets into sales. Building upon these results, NAHATA concludes that reputable venture capitalists do not only select superior VC investments, but also do they add incremental value to their portfolio companies which ultimately results in better investment performance.³⁰⁰

3.2.2.3 VC Syndication & Networks

The capability to syndicate a deal and the ability to network extensively are two more drivers of venture capital success that are closely linked to each other. Syndication is typically defined as the simultaneous investment by at least two different venture capitalists in the same venture within the same investment round.³⁰¹ Thereby, syndication is a common strategy in VC investing which is strongly dependent on the networking capabilities of the venture capitalist. DAS reports that two-thirds of all VC investment rounds in the year 2008 were actually syndicated, highlighting the overall importance for the industry.³⁰² Building upon an overview provided by DAS, multiple arguments were identified in existing VC research to explain this syndication frequency. At first, syndication is assumed to improve the investment deal flow and deal selection activity of the VC firm.³⁰³ Thereby, the decision of a so called lead investor to invite other venture capitalists into a transaction can be based on different rationales.³⁰⁴ One explanation is that despite a fundamentally competitive VC landscape, single venture capitalists are friendly connected and invite each other to promising deals. Although this practice reduces financial benefits from single investment events, the venture capitalists gains access to other investment

²⁹⁹ Nahata (2008), p. 129.

³⁰⁰ Cf. Nahata (2008), p. 149.

³⁰¹ Cf. Bygrave (1987), p. 140; Lerner (1994a), p. 16; Brander, et al. (2002), p. 423; Dimov and De Clercq (2006), p. 210.

³⁰² Das, et al. (2011), p. 1.

³⁰³ Wilson (1968), pp. 119-132; Sah and Stiglitz (1986), pp. 716-727; Lerner (1994a), pp. 16-27; Sorenson and Stuart (2001), pp. 1546-1588.

³⁰⁴ The term lead investor is typically denoted to the venture capitalist who contributes the largest amount of financing in a financing round with multiple investors. Beyond that, the lead investor is the driving force behind the deal that is in particular in charge of the deal structure (i.e. term sheet negotiations) and hence the primary contact to the management of the portfolio company in spe.

opportunities that are occasionally offered to him in return. Interestingly, the participating co-investors typically thereby rely on the extensive due diligence activities of the lead investor. In addition, the existence of a VC syndicate may in general improve the selection process, as relevant previous experience is accumulated in order to evaluate the investment opportunity.³⁰⁵ Second, syndication is an important mechanism to mitigate information asymmetries between early investors into a company and investors that enter into an investment in a later financing round.³⁰⁶ This argument is closely linked to previous discussion on VC reputation. Quite frequently, invested venture capitalists invite reputable VC firms in later stage financing rounds in preparation of an upcoming exit event. It is argued that a convincing group of invested venture capitalists is capable to maximize the potential returns at exit.³⁰⁷ Third, the already discussed value-adding initiatives are further advanced if multiple venture capitalists participate in the financing, i.e. the value adding activities are amplified.³⁰⁸ Similar to the first argument on improved selection capabilities, the complementary accumulation of VC monitoring and development skills potentially leads to higher investment performance.

Although most of these arguments tend towards an overall positive relationship between syndication and investment performance, several arguments can be found that challenge these findings at least. Hence, BRANDER ET AL. argue that due to investment rationales of the lead investor syndicated projects should be in general of intermediate quality: “If the estimated project quality is sufficiently low after this assessment, then the venture capitalist rejects the project outright, as there is little point in seeking a second opinion. At the other extreme, if the assessment yields a high expected value, then the venture capitalist accepts the project, as there is little need for a second opinion.”³⁰⁹ Accordingly, only in cases where the final outcome is unclear, the leading venture capitalist is eager to arrange a syndicated deal. Yet, an exception would be if the entire self-funding of a transaction goes beyond the scope of what the lead investor is voluntarily willed or contractually allowed to commit to one single transaction. In addition, the joint project could be further harmed through moral hazard activities after the

³⁰⁵ Cf. Lerner (1994a), pp. 17f.

³⁰⁶ Cf. Das, et al. (2011), p. 199.

³⁰⁷ Cf. Lerner (1994a), p. 18.

³⁰⁸ Cf. Brander, et al. (2002), pp. 423-452; Hellmann and Puri (2002), pp. 169-197; Lindsey (2008), pp. 1137-1168.

³⁰⁹ Brander, et al. (2002), p. 425.

investment has been made. Hence, building upon fundamental group theory, social loafing behavior may be observed within VC investing.³¹⁰ Interestingly, individuals demonstrate reduced effort when working in a group compared to working alone.

Looking at the existing literature bridging VC syndication and investment success, there is a tendency that overall suggests a positive relationship. However, the results are less explicit as for the other previously discussed performance drivers. BRANDER ET AL. test the impact of VC syndication through the analysis of two different hypotheses. The selection hypothesis, assumes that venture capitalists syndicate in order to get another opinion about the quality of a particular investment. In line with previous considerations, the authors assume syndicated investments to show lower returns compared to standalone projects. The value-added hypothesis, on the other hand, is that syndication adds value to a given project. This suggests that syndicated projects should have higher rates of return.³¹¹ In testing the relative importance of these two hypotheses, they find that syndicated deals have higher returns.³¹² Hence, for their proprietary sample of Canadian VC transaction, they find that syndicated investments had substantially higher average returns of 39% than standalone investments with an average return of 17%.

In their frequently cited study, HOCHBERG ET AL. analyze the relationship of networking capabilities of a venture capitalist and his investment success. In order to do so, they introduce “centrality” as a measure to determine the relative importance of a venture capitalist within the entire VC ecosystem.³¹³ This way, the paper emphasizes on networks as the primary organizational form in the VC industry. The study finds that “better-networked VC firms experience significantly better fund performance, as measured by the proportion of investments that are successfully exited through an IPO or a sale to another company”.³¹⁴ Thereby, factors like the size of the relevant network and the likelihood of being invited to syndicated deals are most important. For a sub-sample of VC funds, the study estimates that a one-standard deviation increase in centrality increases fund IRR by approximately 2.5 percentage points from the 15%

³¹⁰ Cf. Dimov and De Clercq (2006), p. 211.

³¹¹ Cf. Brander, et al. (2002), pp. 449-450.

³¹² Cf. Da Rin, et al. (2011), p. 65.

³¹³ „Centrality“ represents a variable that factors in five different characteristics of the VC firm: (1) the number of VCs with which it has a relationship, (2) the frequency with which it is invited to co-invest in other VCs’ deals, (3) the ability to generate such co-investment opportunities in the future by syndicating its own deals, (4) its access to the best-connected VCs, and (5) the ability to act as an intermediary.

³¹⁴ Hochberg, et al. (2007), p. 251.

sample average.³¹⁵ Similar results can be found by NAHATA who find a better exit performance for venture capitalists that show relatively higher syndication intensity to industry peers.³¹⁶

DE CLERCQ AND DIMOV add additional arguments to the discussion on VC syndication. Accordingly, they are among the first to discuss a potential diminishing marginal return of additional syndication partners. Misaligned goals or less efficient decision making because of more complex coordination requirements are identified for this development. As a result, the costs of managing larger partnerships start to outweigh potential knowledge benefits.³¹⁷ To this regard, in an earlier study the authors found that syndication may also accelerate the risk of investment default. They argue that due to limited resources venture capitalists are more focused on making proprietary investments to become spectacular successes than on preventing complete failure from investments where co-investors are involved in the deal.³¹⁸ Using longitudinal data on the investments, syndication, and performance of 200 US-based venture capital firms, DE CLERCQ AND DIMOV find that syndication, i.e. access to external knowledge, is particularly beneficial when the investment exposes gaps in the firm's own expertise: "(...) access to external knowledge is more effective when an incongruity exists between what the firm knows and what it intends to do."³¹⁹ Finally, the study confirms arguments that general familiarity plays an important role within the syndication process. Hence, familiarity does not only facilitate trust building, knowledge transfer, and joint problem solving among participating partners, but can also exert an indirect disciplining effect on partners' behavior.³²⁰

3.2.3 Portfolio Company-Related Success Factors

The impact of portfolio company related characteristics on the success of VC investments has been far less researched compared to the already introduced arguments on VC firm characteristics. To evaluate whether particular characteristics of the portfolio company have an impact on the ultimate investment success (or not) is a difficult task. Apparently, the general quality of

³¹⁵ Cf. Hochberg, et al. (2007), p. 253.

³¹⁶ Cf. Nahata (2008), p. 131.

³¹⁷ Cf. De Clercq and Dimov (2007), p. 607.

³¹⁸ Cf. Dimov and De Clercq (2006), pp. 219-220.

³¹⁹ De Clercq and Dimov (2007), p. 585.

³²⁰ Cf. Uzzi (1997), pp. 61-62; Robinson and Stuart (2002), pp. 12-14; De Clercq and Dimov (2007), p. 590.

the portfolio company is one if not the most important value drivers.³²¹ Only companies that show an interesting growth story that includes a path to sustainable profitability ultimately achieve attractive divestment proceeds. Better quality, in terms of e.g. an experienced and well diversified management team, highly innovative technologies, marketable products etc., improves the likelihood of company success. To some extent, characteristics like these are already incorporated within the selection process of the venture capitalists (see Table 3-1). As a result, these factors can hardly be researched from a value-adding perspective but should rather be part of the question whether a company is fundamentally capable to receive VC financing. Idiosyncratic components, driven by technology risk, the quality of execution, market acceptance, or competitor reaction are therefore not included in the subsequent discussion.³²²

In contrast, the analysis focuses on potential drivers that are not directly related to the fundamental (intrinsic) quality of the venture. Considering typical characteristics of a VC portfolio companies, these factors comprise the development stage of the portfolio company at the time of the first investment, the industry sector the portfolio company is active in as well as the geographic proximity between the venture capitalist and the portfolio company. In contrast to the before mentioned value drivers of the VC firm, portfolio company related characteristics are typically not at the heart of empirical VC success analysis. Although these factors take often not center-stage within empirical VC success analysis, they are nevertheless important to account for.

3.2.3.1 Development Stage

The development stage of the portfolio company is a first important factor that should be carefully considered whenever the investment performance of single VC transactions is analyzed. Seemingly, more developed portfolio companies are (simply) closer to reaching a (successful) exit from the portfolio of the venture capitalist.³²³ MASON AND HARRISON claim that early stage investments not only involve higher risks but thereby demonstrate an unattractive risk-reward equation.³²⁴ This is further confirmed by historical data showing that later-stage

³²¹ The general issue of endogeneity in the context of empirical VC performance analysis is subsequently addressed in chapter 3.2.6 as well as in the own empirical papers which are presented in chapters 4 and 5.

³²² Cf. Söderblom and Wiklund (2006), p. 23.

³²³ Cf. De Clercq and Dimov (2007), p. 597.

³²⁴ Cf. Mason and Harrison (2004), p. 313.

companies are more likely to go public.³²⁵ Similarly, from a risk perspective, the likelihood of a portfolio company to fail is typically reduced when a company reaches the next phase of its corporate life (see Figure 2-7). Hence, having a high rate of early stage investments within a fund portfolio substantially decreases the overall proportion of successful exits.³²⁶ Overall, companies in early stages of its development are assessed riskier which should have an impact on the average investment performance from these investments.

Besides these identified direct impacts on investment performance, the development stage is also considered to have an indirect influence through its impact on other potential value drivers. Thus, the ability of a venture capitalist to add value is assumed to be higher the younger and less developed a company is at investment date. Thereto, interesting insights on the interaction between the age of the portfolio company and VC firm related success drivers are provided by a recent meta study from ROSENBUSCH ET AL.. Building upon existing research, they assume a trade-off relationship between decreasing uncertainty and, thus, higher likelihood of positive selection and a decreasing return for financial resources and value-added activities provided by the venture capitalist as ventures mature. Accordingly, their study suggests that with regard to corporate stage of the venture there exists a so called “sweet spot” for an optimal age or age range of VC investments when these investments especially benefit the funded firms: “If venture capitalists invest very early, the lack of information might be excessive and lead to the venture capitalist’s inability to successfully select. However, if they invest in very established firms, information is generally abundant and hence their specialized capabilities and relative advantage to operate in environments of risk and uncertainty lose value.”³²⁷ Timing of the first investment and the length of the subsequent investment holding period are important considerations in order to maximize the VC impact for the funded firm.³²⁸

3.2.3.2 Industry

³²⁵ Cf. Das, et al. (2003), p. 3; Sorensen (2007), p. 2750; Sorensen finds that later stage companies have a 4.9% larger probability of going public than early-stage companies. According to Das et al. as many as 44% of the companies in late-stage financings experienced a liquidity event, while only 34% of early-stage firms had a successful exit.

³²⁶ Cf. Hege, et al. (2003), p. 30.

³²⁷ Rosenbusch, et al. (2012), pp. 14-15.

³²⁸ Cf. Rosenbusch, et al. (2012), p. 15.

Another factor that influences the success of a VC investment is the industry affiliation of the portfolio company. Since the inception of the VC industry, venture capitalists invested in a broad variety of different markets and products. However, the funds are typically not spread around multiple industries at all times, but rather channeled into few industries periodically. Hence, in the 1960s financing was in particular devoted to scientific instrument companies, personal computer hardware manufacturers took center stage in the 1980s, in the 1990s the investment focus turned towards the internet and telecommunications industries.³²⁹ More recently, the industry focused on investments in area of clean-tech, e-commerce, “big data” or cloud computing. At any time, the active venture capitalists were focused on identifying the most promising industries in order to capitalize on favorable growth perspectives.

From a performance perspective, the respective industry that a portfolio company is active in is also likely to have an impact on the ultimate investment success. Fundamentally, the general potential for venture capitalists to add value is likely to be dependent upon the dynamics of the particular sector. Hence, in a less technologically dynamic industry the speed and size of the investment commitment from the venture capitalist is more important than the non-financial value added. Such “low tech” business models in general are harder to protect from competition, making a fast market penetration crucial for success. Accordingly, a study by GIOT AND SCHWIENBACHER found that ventures within the internet and biotechnology industries tend to have the shortest route to IPO. Moreover, internet companies demonstrate the shortest average holding periods until a liquidation event.³³⁰ Furthermore, exit multiples vary among industries. According to a study from DAS ET AL. the highest multiples are achieved by investments in the communications, internet and semiconductor sectors, closely followed by exits in the hardware and software industry.³³¹ As a result, performance focused analyses typically control for the respective industry affiliation.

With regard to the previously discussed value adding activities by venture capitalists, the importance of the respective industry in this context is further highlighted by ROSENBUSCH ET AL.. They find that inter-industry selection plays a dominant role compared to intra-industry

³²⁹ Cf. Gompers, et al. (2008), p. 2.

³³⁰ Cf. De Clercq and Dimov (2007), p. 597; Giot and Schwiendacher (2007), p. 695.

³³¹ Cf. Das, et al. (2003), p. 3.

selection and value-adding activities by VCs.³³² Put simply, the selection of the right industry is substantially more important for a successful investment than the selection of the right company or the implementation of specific value-adding initiatives post investment: “Much of the positive performance effects are due to industry selection effects.”³³³ Consequently, the authors argue that once one isolates the effect that venture capitalists have on funded firms within an industry the comparative performance advantages of VC funded firms vanishes. As a result, venture capitalists should be focused in their own recruiting activities on personnel that in particular help the VC firm to identify relevant industry dynamics. Early access to ventures in raising industries seems to be a major contributor to superior investment performance.

3.2.3.3 Geography & Proximity

Eventually, the geography of the portfolio company as well as the geographical focus of the venture capitalist has an impact on investment success as well. The latter relationship is typically discussed under the buzz word “spatial proximity”. The term summarizes the strategy of venture capitalists to focus their investments on determined geographic regions that are close to themselves. In contrast, there are VC firms without a specific geographical focus. Investing very broad geographically has the advantage of generating a higher deal flow that in turn may allow the venture capitalist to invest in potentially better companies.³³⁴ Hence, there is some indication that for example European venture capitalists with a local investment scope have a lower return than companies with a broad geographical scope.³³⁵ However this strategy entails some disadvantages too. Other markets may be different to the home markets of venture capitalists, making it difficult to judge market opportunities or transfer existing knowledge. These differences entail for example the legal, cultural and institutional environment. In addition, investing in geographically distant ventures increases the agency risk and thus agency costs, as monitoring is more effective with face-to-face interactions, which is hard to achieve due to the distance.³³⁶

³³² Cf. Rosenbusch, et al. (2012), p. 2.

³³³ Rosenbusch, et al. (2012), p. 15

³³⁴ Cf. Hall and Tu (2003), p. 188.

³³⁵ Cf. Söderblom and Wiklund (2006), p. 24.

³³⁶ Cf. Patzelt, et al. (2009), p. 564.

SÖDERBLOM AND WIKLUND add considerations regarding the “home market” of a portfolio company to this debate. In this context, the term home market refers to various geography-related aspects that have proven to influence the ultimate success of a venture. Hence, in comparing structural differences between the US and Europe, the sheer scale of the US economy is often mentioned as competitive advantage of US ventures compared to their European counterparts. Thereby, this market is not only characterized by a common culture and language but more importantly by a mobile work force, a wide technological understanding, leading universities and research departments as well as established markets for entrepreneurial capital.³³⁷ This is in sharp contrast to Europe where many national markets are highly fragmented. Considering that the most recent (global) venture success stories are almost exclusively located in the US, SÖDERBLOM AND WIKLUND conclude that a beneficiary home market is an important factor for VC success. Indeed, this home market advantage seems to have played an important role within VC investing in recent decades. Apparently, well aware about their geographic disadvantage, single European venture capitalist were successful with funding European ventures which were ultimately sold to their larger US competitor. This “copy cat” strategy is controversially discussed within the global VC community.³³⁸ Another strategy to overcome potential home market disadvantages is to focus on business models that can quickly be globally scaled.

CHEN ET AL. contribute to this discussion as they study geographic concentration by both venture capital firms and venture capital financed portfolio companies in the US.³³⁹ First of all, they find a surprisingly high degree of clustering within the US VC industry. Accordingly, geographical proximity between individual portfolio companies and their investors, but also among portfolio companies of the same industry offers multiple advantages. Among others portfolio companies benefit from shared (input) resources, labor market pooling or knowledge spillovers effects.³⁴⁰ For venture capitalists, on the other hand, proximity promises a higher degree of personal interaction which raises the venture capitalist’s ability to monitor an existing

³³⁷ Cf. Söderblom and Wiklund (2006), pp. 37-38.

³³⁸ Cf. Winter (2012); The most prominent VC firm following this strategy is the German incubator Rocket Internet. Financed and largely operated by the Samwer family, this company established a corporate infrastructure which is most suitable to copy and build newly developed business ideas.

³³⁹ The motivation for their study is stylized by the fact that more than 50% of the relevant 1,000 venture capital offices in the US are located in just three metropolitan areas – San Francisco, Boston, and New York. In addition, more than 49% of the US-based VC portfolio companies are located in these same three cities (Cf. Chen, et al. (2009), p. 2).

³⁴⁰ Cf. Chen, et al. (2009), p. 4.

portfolio company, to coach the management team, and to provide introductions to relevant key people.³⁴¹

With regard to investment performance the study reveals two key results. First, the study shows an overall higher success rate for companies located in suchlike VC agglomerations which suggest that these centers may be optimal for founding new venture-backed businesses.³⁴² Most interestingly, however, the study finds that venture capitalists who are located in these clusters earn their best returns ironically from investments that are rather remote. Thereto, the authors assume that this outperformance of non-local investments reverts to more restrictive investment selection criteria for suchlike investments, i.e. a specific focus on “home run” investments.³⁴³ A different explanation to this finding is, however, provided by STUART AND SORENSEN who analyzed the performance of companies that belong to various biotech clusters in the US. They argue that the development of industrial clusters generally supports entrepreneurial activity in this field. However, the same factors that enable high tech entrepreneurship in general, do not necessarily promote individual firm performance: “(...) local conditions that promote new venture creation differ from those that maximize the performance of recently established companies.”³⁴⁴ Accordingly, only the best financed companies in these areas are sufficiently “equipped” to outlast fierce competition for scarce resources which ultimately results in company and investment success. In contrast, companies remote from industrial clusters benefit from the reduced likelihood of being copied early on and potentially from a more “relaxed” access to relevant resources.

3.2.4 VC Contracting Related Success Factors

Alongside characteristics that are directly linked to the invested venture capitalist or the financed portfolio company, other success factors are rather connected to the utilized design of the relationship between these two parties. This design is typically constituted by different contractual agreements. Most of these procedures are implemented by means of contractual rights for the investing venture capitalists. Fundamentally, the provision of these rights pursues primarily the goal to reduce the immanent investment risk in VC investing. Nevertheless, to a

³⁴¹ Cf. Chen, et al. (2009), p. 2.

³⁴² Cf. Chen, et al. (2009), p. 26.

³⁴³ Cf. Chen, et al. (2009), pp. 26-27.

³⁴⁴ Stuart and Sorenson (2003), p. 229.

certain extent these arrangements help the venture capitalist to maximize its investment returns as they e.g. prohibit the funded entrepreneur from certain activities or allow the venture capitalists to implement certain measures to further improve the new venture (e.g. initiate management change etc.). Investment rights, staging as well as the utilization of convertible securities as primary financing structure are the most important contractual features that have been found to impact VC investment success.³⁴⁵

3.2.4.1 VC Investment Rights

Several studies show that the utilization of sophisticated investment rights bears the potential to have a significant impact on VC investment returns. Thereby, financial contracts are typically written to assign board, liquidation, cash flow and other control rights between contracting parties, e.g. a venture capitalist and an entrepreneur.³⁴⁶

A study by HEGE ET AL. analyzes the contractual determinants of success in VC financing by comparing the conditions in a mature VC market like the US with those in a relatively new market for VC financing like Europe. The study reveals the following two results. First, US VC firms show a significantly higher performance on average than their European counterparts. This result is confirmed both for the type of exit and the achieved rates of return. Secondly, US venture capitalists rely more heavily on the various types of control rights. As a result, not only convertibles are used more frequently but also more often the decision is made to replace the existing entrepreneur. Accordingly, the authors argue that “this performance gap may be attributable in parts to [differences] in the contractual relationship between venture capitalists and start-up entrepreneurs”.³⁴⁷

Similarly, for a sample of European VC investments CUMMING finds that financial contracts are rather heterogeneous in terms of both the cash flow and control rights. Furthermore, the analysis shows that the “likelihood of different types of exit vehicles (IPO, acquisition, and liquidation) and the returns to venture capital depend on not only firm specific characteristics but also the allocation of cash flow and control rights. Ex ante, stronger VC control rights increase the likelihood that an entrepreneurial firm will exit by an acquisition, rather than through

³⁴⁵ These three categories represent an aggregation of the previously introduced seven „features“ that are typically used to structure a VC investment (see chapter 2.2, pp. 36-37).

³⁴⁶ Cf. Söderblom and Wiklund (2006), p. 29.

³⁴⁷ Hege, et al. (2003), p. 21.

a write-off or an IPO.”³⁴⁸ Unfortunately, the author falls short on providing further arguments for this finding. However, one can assume that the ability to exert influence on the selection of the desired exit route increases with the number of rights granted to the investing venture capitalist. As an acquisition exit is often a more projectable exit (although potentially with reduced return potential) than an IPO, venture capitalists seem to use their rights to triggers suchlike exit events. Finally, CASELLI ET AL. analyze the impact of covenants and the appointment of directors in the board of target firms. They confirm better investment performance for the utilization of covenant-heavy contracts.³⁴⁹

3.2.4.2 VC Staging

Staging represents the sequential payout of capital from the venture capitalist to the portfolio company, often dependent on whether the venture is capable to achieve predetermined operational or financial goals.³⁵⁰ This way, staged financing is a strong tool for venture capitalists to control activities by their portfolio companies.³⁵¹ Consequently, several studies analyze the relationship between the staging degree and the investment performance of VC transactions. Interestingly, no clear pattern can, however, be identified whether staging ultimately positively or negatively contributes to investment success.³⁵²

Hence, GOMPERS shows that portfolio companies divested by means of an IPO receive on average a higher number of cash-injections throughout the investment period than companies that are ultimately acquired or liquidated.³⁵³ Apparently, staged financing is not only an appropriate method to reduce investment risk, but it also represents a valuable option for the VC firm to deny or delay additional funding. This leads to a more reasonable use of scarce financial resources.³⁵⁴ This is empirically confirmed by WANG AND ZHOU who provide evidence that staging is more profitable compared to upfront investments, thanks to lower agency costs.³⁵⁵ TIAN researches the interdependence of staging and the distance between the portfolio company

³⁴⁸ Cumming (2008), p. 1947.

³⁴⁹ Cf. Caselli, et al. (2011), p. 1

³⁵⁰ Cf. Krohmer, et al. (2009), p. 1597.

³⁵¹ Cf. Söderblom and Wiklund (2006), p. 29.

³⁵² Cf. Krohmer, et al. (2009), pp. 1597-1609.

³⁵³ Cf. Gompers (1995), p. 1464.

³⁵⁴ Cf. Sahlman (1990), pp. 503-504; Megginson (2004), pp. 94-95; Söderblom and Wiklund (2006), p. 29.

³⁵⁵ Cf. Wang and Zhou (2004), pp. 132-133.

and the venture capitalist. This way, the study examines whether staging and monitoring have a complementary relationship. He finds several positive effects of staged financing in the context of an IPO exit. First, the total number of financial injections seems to be positively related to the overall likelihood of a public exit. Besides, staging seems to have a positive impact on the operating performance and the general post-IPO survival rate. However, these relationships are only found if the venture is located far away from the venture capitalist. He also shows that “VC investors located farther away from an entrepreneurial firm tend to finance the firm using a larger number of financing rounds, shorter durations between successive rounds, and investing a smaller amount in each round.”³⁵⁶

On the other hand, some researchers suggest that there may be a theoretical basis for expecting negative returns from the use of staging.³⁵⁷ Hence, CORNELLI AND YOSHA suggest that staging motivates entrepreneurs to window-dress, i.e. to positively bias the short-term performance of the venture.³⁵⁸ HEGE et al. provide supporting empirical evidence. In contrast to standard manager-shareholder agency theory, they find a negative relationship between the number of financing rounds and investment performance.³⁵⁹ Finally, KROHMER AND LAUTERBACH find arguments for either result. Thus, they find a significant positive influence of staging during the early phases of a VC investment. This suggests that “investors successfully use staging to mitigate agency problems and take an active hand in company management that may help boost the probability of success”.³⁶⁰ Interestingly, however, they find an opposite effect for financial staging applied in later stage rounds. They argue towards a so called termination dilemma that investors face: “If a portfolio company is struggling and the investor chooses to terminate, he or she avoids throwing good money after bad, but also forfeits the option of a potential turnaround or perhaps a better (less negative) return at the moment of termination.”³⁶¹

³⁵⁶ Tian (2011), p. 132.

³⁵⁷ Cf. Bergemann and Hege (1998), p. 726; Cornelli and Yosha (2003), p. 1.

³⁵⁸ Cf. Cornelli and Yosha (2003), p. 1.

³⁵⁹ Cf. Hege, et al. (2003), p. 20.

³⁶⁰ Krohmer, et al. (2009), p. 18.

³⁶¹ Krohmer, et al. (2009), p. 18.

3.2.4.3 Convertible Securities

As a fundamental tool to align the interest of the entrepreneur and the venture capitalist, there are a large number of theoretical publications on the utilization of convertible securities in VC financing.³⁶² Thereby, convertible equity blends features of debt and equity into a single security. This way, the venture capitalist initially owns a debt-like claim – comparable to a loan – against the company, earning interest that accrues unpaid by the company. But unlike regular debt, at maturity of the security the venture capitalist has the option to convert their loan into common equity in the company. Apparently, the latter option is usually exercised in the case of a successful development of the portfolio company, valuing the resulting equity stake substantially higher than the face value of the outstanding debt claim. A comprehensive overview of the various theoretical models that explain the utilization of convertible securities in VC financing can be found at DA RIN ET AL.³⁶³

Empirical evidence on the relationship between the utilization of convertible equity and investment performance however faces substantial empirical challenges. Accordingly, only one study could be identified that explicitly analyzes the link between the utilization of convertible financing and its impact on investment performance. CUMMING AND WALZ provide evidence that convertible securities with periodic cash flows enhance investment returns.³⁶⁴ They explain this finding with the argument that the potential pay-off scheme of suchlike securities gives rise to incentives for the venture capitalist to provide value-added advice and to efficiently monitor his portfolio firms. Fundamentally, this analysis bears however one major pitfall. If one empirically finds a correlation between contracting, i.e. the specific use of convertible financing, and investment performance, this result may still be “due to unobserved differences across venture capitalists and portfolio companies rather than to suboptimal contracting choices”.³⁶⁵ Consequently, the important question whether contracting choices are selected exogenously would need to be answered first.

³⁶² See among others Sahlman (1990), Cornelli and Yosha (2003), Kaplan and Strömberg (2003), Megginson (2004), Cumming (2008), Cumming and Walz (2010).

³⁶³ Cf. Da Rin, et al. (2011), p. 26.

³⁶⁴ Cf. Cumming and Walz (2010), p. 748.

³⁶⁵ Da Rin, et al. (2011), p. 34.

Additional empirical evidence, most interestingly on deal-level is finally provided by LAUTERBACH ET AL.. Analyzing a comprehensive subsample of the CEPRES database, they find rather contradicting results compared to CUMMING AND WALZ. Their study design is chosen in order to analyze whether the positive performance impact of a certain determinant is rather achieved through maximizing investment returns or though minimizing investment losses. Due to their technical “set-up”, convertibles are assessed to primarily provide a suitable defense mechanism to reduce potential investment losses. In particular compared to the utilization of common equity, convertibles are structured in a way that they generate a lower payoff if the investment proves to be successful. “This [in turn] explains the expected negative effect that convertibles have on maximizing profits. In respect of the sample as a whole, the negative effect that convertibles have on value maximization contributes [however] disproportionately to the positive effect in respect of reducing losses (...).”³⁶⁶

3.2.5 Market-Related Value Drivers

The last group of VC success factors finally embraces all drivers that fall outside of directly attributable characteristics of the venture capitalist, of the portfolio company or of the contractual relationship between these two parties. Circumscribed as market-related, this category contains various factors that have proven to have a considerable impact on the success of a particular VC investment. The prevailing sentiment on the respective capital markets throughout the investment holding period, the general level of VC activity at the time of the investment, as well as the relevant legal and regulatory environment of the respective country are therefore subsequently discussed with regard to their impact on VC performance.

3.2.5.1 Capital Markets

The most obvious point where the VC business model “clashes” with the general capital market is at the time where an investment is supposed to be divested. As large parts of their overall returns are achieved through IPOs, venture capitalists rely heavily on the public capital market in order to harvest their investment yields. Besides this apparent relevance as fruitful exit path, the sentiment on the capital markets influence VC investing and its related returns in rather manifold ways. The various impacts are thereby best to be discussed along the timeline, i.e. holding period, of a VC investment. Accordingly, capital market considerations not only

³⁶⁶ Lauterbach, et al. (2007), p. 61.

affect the exit strategy but play an important role at the time of the investment decision as well as throughout the holding period.

Reflecting on the outlined investment process of a venture capitalist, one could assume that his investment decision should be rather disconnected from the capital market. Indeed, the fundamental investment criteria (see Table 3-1) are first and foremost focused on the individual attractiveness of the venture. However, once an investment shows attractive investment patterns, the broader capital market plays typically an important role in the forthcoming negotiations of the underlying valuation of the company. The value, which is crucial to determine the resulting ownership stake of the venture capitalist, is often directly linked to the capital market. Hence, certain valuation methodologies derive the relevant metrics to calculate a company value from public market valuations.³⁶⁷ Accordingly, booming capital markets induce an upward pressure on the prices that venture capitalists have to pay for their investments. Subsequently, high entry prices bear the risk of limited returns at the end of the holding period. This is in particular problematic if the sentiment changes throughout the investment period. Depressed public market valuations and limited availability of IPOs as an exit channel harm the overall return potential. The same logic is apparently valid for any kind of intermediate financing round which is frequently required throughout the holding period of a VC investment. Finally, the outlined mechanism also works the other way round, where the VC enters into a transaction at deteriorated price levels and later on benefits from recovered level of valuations at the time of the exit.

KAPLAN AND SCHOAR provide empirical evidence for this relationship as they compare the performance of relevant equity indices like the S&P 500 or the NASDAQ to VC fund-level performance. They find that VC firms that raise funds in times of high market returns are subsequently less likely to raise a follow-on fund.³⁶⁸ Building upon their general finding on return persistence within the VC industry, they conclude that funds raised in boom years are more likely to perform poorly. Further evidence is reported by MCKENZIE AND JANEWAY. For a sample of Australian VC funds, they find that the public equity market has a substantial impact on venture capital returns. In particular, the prevailing conditions at the time of exit are of importance and lead to large swings in fund performance. Accordingly, “poor exit conditions

³⁶⁷ Cf. Achleitner and Nathusius (2004), pp. 115-140.

³⁶⁸ Cf. Kaplan and Schoar (2005), p. 1817.

are associated with an average IRR of 7%, neutral exit conditions produce a median IRR of 20% and favourable exit conditions generated an IRR of 69%.”³⁶⁹

Prospering capital markets have yet another – rather indirect – impact on the VC ecosystems. Thus, spurred by radical innovation or even the advent of entire new industries IPOs typically appear in waves, i.e. periods where new listings happen frequently are followed by periods where hardly any company goes public at all. Good examples would be the high frequency of biotech IPOs throughout the 1990s and the vast amount of internet IPOs at the beginning of the new century. In contrast, the IPO window was almost entirely closed in the aftermath of the burst of the dot.com bubble or during the global financial crisis in recent years. During peak periods, however, established companies typically become themselves more active in these areas in order to maintain their market leading positions. Thereby, they are usually driven by the fear to miss out on “the next big thing” or worse being replaced by an uprising competitor. In addition, as share prices surge, these companies use their appreciating stock as currency to buy into most promising markets. Resulting, these companies represent an interesting alternative exit channel by means of acquisition for invested venture capitalists.

In order to reduce this strong dependency from the capital market appetite, venture capitalists began in recent years more frequently to pursue a so called dual track strategy. This strategy was originally designed by capital market experts like investment banks to maximize not only the likelihood of an actual exit event but also to maximize the possible return on investment. Dual track thereby means that the venture capitalist simultaneously pursues to exit his portfolio company by means of an IPO or a strategic sale to an interested company. For that purpose, the venture capitalist hires advisors that on the one hand test the investor appetite of the public market, but on the other hand screen the interest for a full take-over by a single strategic buyer. Well executed, this process potentially promises returns that justify higher transactions costs. By means of competitive bidding tension most value is extracted from potential investors. BRAU AND SUTTON provide first empirical evidence for the US. According to their study dual-track exits of privately, e.g. venture-backed, companies earn a premium of 22% to 26% greater than if the company would have been divested on a single track.

³⁶⁹ McKenzie and Janeway (2011), pp. 783-784.

3.2.5.2 Activity Level of the VC Industry

Closely linked to the effects of booming capital markets on VC performance are factors that are related to the general level of activity within the VC industry. Hence, the number of successfully underwritten IPOs typically impacts the general attractiveness of VC as an asset class. The more success stories of VC backed companies are documented by the media, the more public attention VC gains as an asset class.

As a result, the overall activity of the VC industry experiences substantial volatility. Thereby, VC fundraising as well as VC investing fluctuates in line with swings on the capital markets.³⁷⁰ Several factors are responsible for this development. First of all, the willingness of limited partners to invest additional funds into VC increases as a higher number of successful exits increases the funds distributed back to the investors. Beside a higher perceived attractiveness, fundraising is also supported by portfolio strategy related mechanisms. As the value of allocated funds into public equity increases, institutional investors are requested to increase their total funding into alternative asset classes (like VC) in order to maintain predetermined allocation ratios among single asset classes.

Next to higher allocation to existing VC firms, the general funding capacity is further expanded through the advent of additional VC providers. Three types of investors can be identified. First, specialized funds emerge that are often exclusively dedicated to the latest technology trend. These funds are either operated by established VC firms in order to further increase their exposure to new industries or by new market entrants that become investors due to their expertise in the respective field. Secondly, additional funds are provided by early entrepreneurs in the corresponding industry. Having successfully sold their own company, these former founders frequently return as venture capitalists. Building upon their own wealth and hands-on experience, they typically raise external money in order to further participate in the growth of the new technology. Third, corporate venture capital (CVC) is another VC market participant that

³⁷⁰ Cf. Lerner (2002a); Gompers, et al. (2008).

historically demonstrated great volatility with regard to total investing volumes. Often motivated by a favorable corporate and industry outlook, suchlike in-house units are founded with the declared goal to assess opportunities from new technologies for the own company.³⁷¹

The question whether this expansion of VC funds is fundamentally justified or represents an overreaction to favorable capital market conditions is controversially discussed among academics and practitioners. In particular the interplay between supply and demand of VC and its consequences on investment performance has not yet been fully answered. Primary obstacle thereby is as often within private equity a lack of suitable data (see chapter 4). Existing empirical evidence – on fund-level as well as on deal-level - provides to date a heterogeneous picture. In general, the ability to harvest attractive returns from investments in boom times should be reduced. Hence, besides potentially higher prices that have to be paid due to fierce competition, it is likely that increasing funding flows are also driven by strong optimism about quality of available investment opportunities. Furthermore, VC firms are potentially not capable to scale their relevant personnel resources in line with provided funding. The latter potentially harms the general ability of the venture capitalist to diligently select and subsequently monitor its portfolio companies.

Potentially motivated by the excessive developments over the course of the internet technology bubble, GOMPERS AND LERNER are among the first to ask the question whether a “money chasing deal” phenomenon could be observed within the VC industry. Focusing on US data prior to 1995, they find that in times of higher inflows to venture capital funds, the fundamental valuations of VC investments tend to increase as well.³⁷² The authors interpret this price increase as evidence that the observable inflows are a result of overestimated investment opportunities. If inflows would simply match fundamental investment opportunities the valuation level should not show any material changes. Interestingly, the study finds, however, no impact of this price movement on the ultimate success of individual investments: “Changes in valuations do not appear related to the ultimate success of these firms. The findings are consistent with competition for a limited number of attractive investments being responsible

³⁷¹ Cf. Da Gbadji, et al. (2011) provide interesting evidence from Global Fortune 500 companies on their motives to set up CVC programs. Gompers and Lerner (2000a) and Chesbrough (2002) discuss the organizational challenges that suchlike units typically face as they are required to simultaneously pursue organizational as well as financial goals.

³⁷² Cf. Gompers and Lerner (2000b), p. 321.

for rising prices.”³⁷³ A few years later, GOMPERS ET AL. extent this study as they analyze the investment outcomes of a substantially larger US sample. They find that in particular venture capitalists with a high degree of industry experience extend their investment activity in line with public market signals. However, once again, they find that higher investment rates have no adverse impact on investment outcomes. Resulting, the authors conclude that their finding is “consistent with the view that venture capitalists rationally respond to attractive investment opportunities signaled by public market shifts.”³⁷⁴ On fund-level, recent research on this topic is provided by DILLER AND KASERER. Building upon the theoretical consideration by GOMPERS AND LERNER, they find for a European sample of private equity funds that in particular the performance of VC funds is driven by total fund inflows. Hence, they find robust evidence that VC funds which are raised in times where money is overly focused on a particular asset class like VC (as compared to general private equity) perform significantly worse than funds raised in times of moderate or more diversified fund inflows.³⁷⁵ The authors conclude that VC, characterized by substantial illiquidity, stickiness, and segmentation, is in particular prone to overshoot in times of excessively positive market evaluations.³⁷⁶

3.2.5.3 Legal & Regulatory Environment

Whether a country’s legal and regulatory environment has an impact on VC performance is finally discussed. This perspective is of interest as recent research with the focus on cross-country differences reveals differences for local VC markets. Thereby, the question remains whether these differences are ultimately reflected in VC performance as well.

The vast majority of existing cross-country related research is focused on the general impact on VC activity. Hence, researchers focus in particular on the question whether politicians can generally influence a country’s entrepreneurial activity in order to benefit from it on a broad economic perspective. AMMOUR AND CUMMING analyze institutional factors that stimulate VC activity. In their study “The legislative road to Silicon Valley” they try to determine strategies which allow policymakers to establish successful VC ecosystems. Analyzing data from 15 countries, they find that the legal system of a country influences both supply of and demand for

³⁷³ Gompers and Lerner (2000b), p. 281.

³⁷⁴ Gompers, et al. (2008), p. 1.

³⁷⁵ Cf. Diller and Kaserer (2009), p. 660.

³⁷⁶ Cf. Diller and Kaserer (2009), p. 671; additional information how these fundamental characteristics affect VC investment returns are provided throughout chapter 4.

VC: “Favorable fiscal and legal environments facilitate the establishment of venture capital and private equity funds and increase the supply of capital. Similarly, liberal bankruptcy laws stimulate entrepreneurialism and increase the demand for venture capital.”³⁷⁷ Considering general legal systems, the research typically focuses on differences between countries that have an established common law practice and countries that are characterized by civil law regimes. In his study, MEGGINSON provides an interesting overview on the intensity of VC spending compared to GDP for major industrial countries. They find that the intensity in common law countries (1.14%) is almost three times as high as for countries under civil law regimes (0.31%).³⁷⁸ Apparently common law countries are characterized by greater investor protection and consequently larger and hence more liquid capital markets.

Little evidence to date is provided on performance implications. LERNER AND SCHOAR find that VC investment returns tend to benefit from investor friendly regulation in common law countries. As fundamental driver behind this observation they assume that a higher usage of convertible securities which ultimately better align the interests of the venture capitalist and the entrepreneur to be responsible for this result (see chapter 3.2.4.3). In countries with a civil law (or socialist) legal background, investors typically “rely more heavily on obtaining majority control of the firms they invest in, use debt more often, and have more board representation.”³⁷⁹ As more ownership and control is “taken away” from the entrepreneur in order to protect the investor, suchlike investment structures seem to represent a second-best solution to achieve attractive investment returns only: “We find that firms’ valuations are significantly higher in nations with a common law tradition, and superior legal enforcement and private equity funds investing in common law countries enjoy higher returns.”³⁸⁰ CUMMING AND WALZ find that reported intermediate returns are higher in countries with less-stringent accounting rules and weaker legal systems. However, as these reported return differences disappear if real returns are considered, they criticize a limited information content of overstated interim investment performance. Consequently, they propose to install strong legal accounting standards which

³⁷⁷ Armour and Cumming (2006), p. 630.

³⁷⁸ Cf. Megginson (2004), p. 6.

³⁷⁹ Lerner and Schoar (2005), p. 223.

³⁸⁰ Lerner and Schoar (2005), p. 242.

should in the long-term improve the provision of VC as the communication between institutional investors and venture capitalists is more accurate.³⁸¹

Finally, the direct participation of government owned investment companies or explicitly designed investment programs are controversially discussed among practitioners and academics. Due to their overall positive economic impact, numerous countries established programs to support general entrepreneurship as well as the foundation of specific companies. The Small Business Innovation Research (SBIR) program in the US or the High-Tech Gründerfonds (HTGF) in Germany are two samples for suchlike programs.³⁸² Thereby, the general debate circles around the question whether this kind of “intervention” rather supports or hinders the investment activity and/or investment success of private VC firms. Looking at existing research, unfortunately no clear conclusion can be drawn. A European focused study by LELEUX AND SURLEMONT finds no significant results for none of these arguments. According to their results, governmental VC does not have the capability to significantly promote private VC investment activities. In contrast, the study reveals that public VC rather follows the investment tendencies of private VC firms. On the other hand, no negative impact through the “crowding-out” of private VC can be observed either.³⁸³ The limited capability of public VC to spur the creation of entrepreneurial companies is recently confirmed by a study from the BVCA. Hence, the overall effect of various governmental programs in the UK “has been small, and significantly less than the effects that purely private venture capital would be expected to bring.”³⁸⁴ Another rather negative view on government programs is presented by ARMOUR AND CUMMING. They find that suchlike programs “more often hinder than help the development of private equity”.³⁸⁵ Public VC spending is in contrast assessed to be potentially helpful during economic downturns where private investors are extremely cautious due to uncertain future prospects.³⁸⁶ The fundamental empirical impact on the performance of private venture capitalists

³⁸¹ Cf. Cumming and Walz (2010), p. 751.

³⁸² Additional information on these programs can be found at the respective webpages. SBIR: <http://www.sbir.gov/>; HTGF: <http://www.high-tech-gruenderfonds.de/>.

³⁸³ Cf. Leleux and Surlemont (2003), p. 99.

³⁸⁴ BVCA (2009), p. 4.

³⁸⁵ Armour and Cumming (2006), p. 596.

³⁸⁶ Cf. Jeng and Wells (2000), p. 241.

is yet to be researched in more detail. Considering the above mentioned arguments, governments are best advised to guarantee a reliable legal framework which ultimately encourages risk-taking investors to invest in entrepreneurial companies.

3.2.6 Limitations

The presented literature review on VC performance drivers provides a comprehensive overview. The focus is on the plurality of different factors that have been discussed to have an impact on VC performance. For that purpose, the author developed a suitable framework to present the different drivers in a structured manner. In addition, the relevant limitations with regard to the utilized literature have been initially introduced. Besides that, however, the presented results are subject to further limitations which should be carefully considered.

At first, it has been already noted that the developed framework itself contains some limitations. Building upon this framework, individual performance drivers are predominantly intended to be presented in a *mutually exclusive* way. This is done with good cause in order to discuss relationships as simple as possible. This procedure, on the other hand, bears the risk to miss out on important interactions among individual drivers. To this end, the close interaction of e.g. VC experience, VC specialization and ultimately VC reputation has already been introduced. Another example would be the interaction of VC activism and the application of certain contractual designs.

Hence, the consideration of specific investment rights or the implementation of staged financing are closely linked to the monitoring activities of the venture capitalists. Similarly, the impact of certain drivers might also be moderated by other performance determinants. Hence, the positive impact of e.g. VC specialization might turn upside down in times of “hot” markets where too much money is directed towards specific industries. A very specialized fund might be most encouraged to expand his investment activity and accordingly suffers the most from mediocre investments as soon as the industry prospective for this sector depresses. In addition, it must be reiterated that for the majority of the studies, only key results with regard to the most important outcomes are presented. Accordingly, the study results are allocated to the part of the framework that best matches the central research objective. This procedure neglects to some extent, however, that individual studies deal with multiple objectives at a time.

Another pitfall that needs to be mentioned is closely linked to the introduced problem to get access to *appropriate data* due to the nature of VC investments. As access to suitable data is

only slowly improved, previous research is often forced to proxy relationships by means of rather “*abstract*” variables. A catchy example is the frequent utilization of the age of the venture capitalist as a proxy for his experience. Looking at this relationship, two potential pitfalls could be criticized. First of all, one could argue whether the age of the VC firm is an appropriate measure for experience after all. Hence, specific deals are commonly rather driven by relatively newly recruited investment managers hired for their expertise in areas that are currently “en vogue”. Whether the age of the entire firm is therefore a good proxy for the relevant experience can at least (partly) be doubted. Besides, it could be criticized that experience after all is not the actual “transmission belt” that causes better or worse performance. Hence, whenever suchlike relationships are discussed one always assumes that experience ultimately translates into more efficient activities that actually add value to the portfolio company. Both critics are totally appropriate and the provided results must be seen under these considerations. Nevertheless, from an empirical perspective suchlike obstacles can hardly be addressed at all. Hence, in most cases it is simply impossible to get the relevant data. It is neither possible to collect experience data for single individuals nor would it be possible to analyze every single value-adding activity that is foregone by a venture capitalist (through the holding period of an investment). The use of approximations to examine suchlike relationships is therefore in some cases (unfortunately) inevitable. Another approximation, which has a great potential to “disturb” the true nature of identified relationships, is the frequent estimate of VC success through the use of the achieved exit type as performance measure (see chapter 3.1.1).

As will be further discussed in the upcoming two analyses, potential *data biases* within the exploited data sets are other important limitations. Suchlike limitations have already been touched upon in the provided overview of frequently utilized VC sources in chapter 3.1.3. Hence, first of all the represented GPs within a VC data set need not necessarily be a true reflection of reality. A potential bias occurs whenever the composition suffers from partialities. A frequently discussed example is the potential exclusion of underperforming VC firms from databases that rely on voluntarily disclosed data. Furthermore, specifics with regard to the examined period of time, industries or geographies of the underlying data need to be carefully considered. In particular, whenever the actual economic implication of a change of a performance driver is discussed, the context of the analysis is of importance. In these cases the presented results almost certainly reflect outcomes for specific regions, time periods, or industries and a broader generalization is maybe not appropriate. Nevertheless, the general direction of

the relationship should be of universal validity due to an ongoing convergence process on the international VC markets.³⁸⁷

Endogeneity issues are the most important limitations which are frequently discussed within VC performance research. In this context, the relevant problem is often based on simultaneity and/or the non-consideration of relevant determinants, i.e. so called omitted variables. Simultaneity is always present when the mode of action between two factors is difficult to assess. Hence, the thoughtful identification of causes and effects among various discussed relationships is often far from trivial and needs to be carefully considered: “At this stage the literature has not yet provided convincing solutions to the fundamental endogeneity problems.”³⁸⁸ The following examples serve as an illustration for this limitation. DA RIN ET AL. discuss endogeneity with regard to VC staging. Methodologically, the biggest concern is that staging is typically measured ex-post, i.e. the number of cash injections into a portfolio company, and not ex-ante as originally specified in the financing contract: “As a consequence, it is difficult to distinguish staging behavior from underlying company performance. For example, observing more rounds or shorter intervals between rounds could be the result of deliberate VC staging, but it could also be the result of good performance in terms of a company meeting its milestones faster.”³⁸⁹

Similar discussions are provided on the relationship between VC performance and VC networking as well as VC reputation. Accordingly, it is (at least) debatable whether reputation effectively leads to better investment performance or vice versa. Potential endogeneity issues concerning VC activism are also widely discussed. Fundamentally, the discussion circles around the question whether GPs simply adjust their behavior when individual portfolio companies do well, i.e. paying more attention to strong performing companies (although such activism does not necessarily enhance performance), or whether VC activism indeed improves investment success. This is perfectly illustrated by the close analysis of the following three different explanatory approaches on this relationship. First, VC activism could be significantly intensified in times when the portfolio company seems to be in trouble. As a result, activism would be extended “when the need for oversight is larger”.³⁹⁰ Alternatively, venture capitalists

³⁸⁷ Cf. Megginson (2004), pp. 89-90.

³⁸⁸ Da Rin, et al. (2011), pp. 69-70.

³⁸⁹ Da Rin, et al. (2011), pp. 40-41.

³⁹⁰ Lerner (1995), p. 301.

could rather tend to follow “home-run strategies”, i.e. “focus attention on the winners in their portfolios rather than ventures that are expected to yield little return.”³⁹¹ Finally, attention could also be closely linked to reputational consideration. Following this theory, venture capitalists are eager to focus their attention on any events that contribute most to an overall good reputation. Taking this perspective, managerial activity would be channeled into both, high-flyers and potential write-offs in order to maximize reputational perception.³⁹² As none of these arguments can be easily dismissed, this discussion provides a good sample for endogeneity risk due to reverse causality within the entire performance discussion. Hence, endogeneity needs to be diligently taken care of if the performance drivers behind VC success are analyzed. It should therefore be noted that the introduced studies conduct a great amount of empirical tests to check whether the respective study results are in any way affected by suchlike limitations. More information on this topic can be found in the upcoming own empirical analysis as well as in the robustness sections of the presented studies.

Finally, whenever possible the presented overview of relevant literature is focused on the impact on VC investment performance. As already discussed in chapter 3.1.1, to this regard the absolute return that venture capitalists achieve through their investing activity is at the core of the analysis. Accordingly, little evidence has been provided to which extent individual drivers are suitable to reduce the respective investment risk. Furthermore, the presented relationships are not compared to other asset classes as the analysis does not intend to benchmark VC returns (and their origins). Similarly, the literature selection is also focused on the pre-exit period of a VC investment. Accordingly, any value creation that ultimately impacts VC returns that take place after the actual exit from the perspective of the VC are not discussed. This way, literature on the potential underpricing of VC-backed IPOs or the positive impact of VC board seat representation after the actual IPO is not included.³⁹³

3.3 Motivation for Own Empirical Analysis

Building upon the current status quo of VC research as presented throughout chapter 3.1 and 3.2, the following two chapters represent own research that further contributes to this overview.

³⁹¹ Sapienza, et al. (1996), p. 463.

³⁹² Cf. Fingerle (2005), p. 155.

³⁹³ See among others e.g. Barry, et al. (1990); Gompers (1996); Lee and Wahal (2004); Sousa (2010).

Thereby, the own research is presented by means of two independent academic papers. Each of them contributes to a better understanding of VC performance. Both chapters result from research that the author conducted as a research assistant at the *Department of Entrepreneurial Finance supported by the KfW Bankengruppe*.

The own empirical research was primarily motivated through the access to highly suitable data to analyze VC investment returns. The research fundament is built upon a close cooperation with two leading European fund-of-funds.³⁹⁴ Together, both fund-of-funds combine for more than \$22 billion of assets under management in private equity. More importantly, however, these funds gain access to a very broad range of investment performance as they analyze the historical performance of GPs. This task is a key activity of suchlike funds in order to make diligent capital allocation decisions. Through this cooperation, the author gained access to proprietary VC data which allows the analysis of questions which could previously hardly or not at all been answered. Both papers, thereby, rely on the new access to deal-level focused performance data on the basis of precise cash-flows that were exchanged between GPs and their respective portfolio companies throughout the holding periods.

The focus of the own research questions has further been motivated by recent developments on the global VC markets. Still suffering from the long-lasting aftermath of the burst of the dot.com bubble, the VC industry was hit badly by the recent financial crisis. As a result, VC fundraising and investment activity fell sharply again. According to data from TVE, global VC investments dropped from \$106 billion in 2008 to \$59 billion in 2009, i.e. by 44% year-on-year. With 51% year-on-year, the decline was even more pronounced for the US. The impact on individual investment has shortly thereafter been confirmed by BLOCK AND SANDNER. They found that the financial crises led to a decrease in the average amount of funds raised per funding round by 20%.³⁹⁵ Thereby, later financing rounds were even more affected than early stage investments.

More importantly, returns from VC investments have been disappointing for more than a decade now. Figure 3-6 shows vintage year returns for US VC funds for the period between 1980 and 2006. Most recent vintage years are not included as most of these funds will still

³⁹⁴ Due to contractual restrictions the names of these funds-of-funds cannot be revealed.

³⁹⁵ Block and Sandner (2009), p. 295.

contain a substantial number of investments which have not (yet) fully been exited. Most concerning, however, any vintage after 1999 failed to even return on average its invested money, i.e. showing DPIs below 1.0x. Looking at similar data, LERNER is rather skeptical that most recent vintages will likely return any better returns and moreover raises concerns on the ever increasing holding periods: “While there may be still-to-be harvested investments in these portfolios that will ultimately be taken public and sold, which may increase the ratio of distributed to paid in capital, certainly investors have been waiting for a long time for their returns.”³⁹⁶

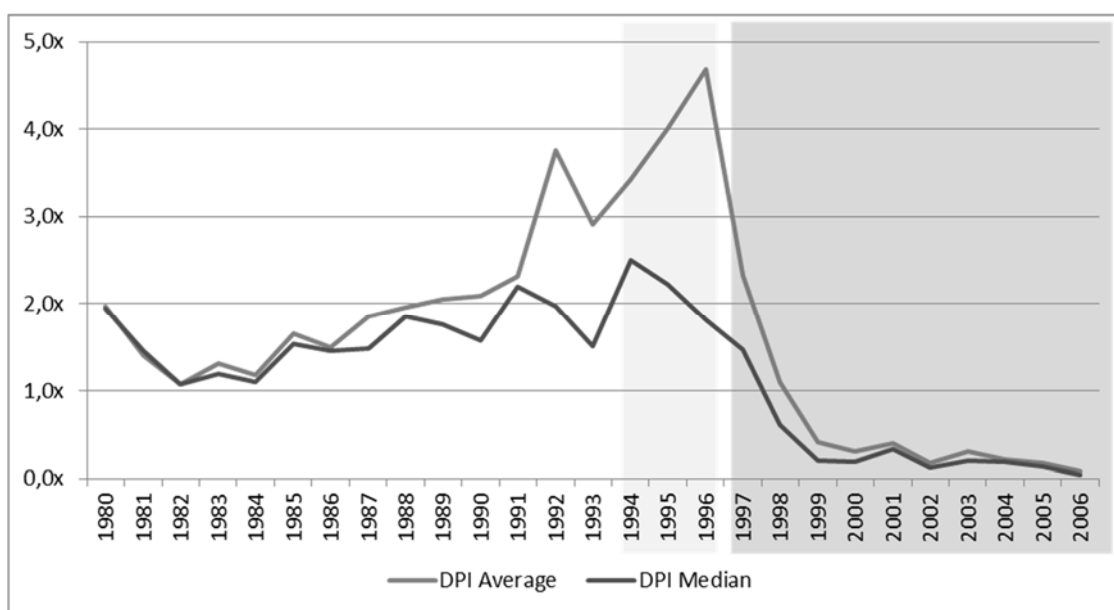


Figure 3-6: Distributed Cash Multiples for US VC by Vintage Year³⁹⁷

Searching for causes of these devastating investment results – keep in mind that VC is assessed to be a high risk asset class which resulting should demand high levels of returns – LERNER names two primary reasons: A potential mismatch of demand and supply of VC, and a moderate availability of IPOs to exit investment successfully.³⁹⁸ Interestingly, both mentioned factors fall within the fourth, i.e. market-related, category of performance drivers. If LERNER’s first suppositions would prove true, one would need to seriously worry about the future of VC. This would mean that performance is by and large driven by factors which seemingly cannot be directly influenced by the individual venture capitalist. To take this argument to extremes

³⁹⁶ Lerner (2011), p. 11.

³⁹⁷ Source: Based on TVE as of 30/6/2010.

³⁹⁸ Cf. Lerner (2011), pp. 11-12.

this implies that investing in VC does not mean to invest in capable investors but to merely “gamble” on favorable market conditions.

To shed more light on this disturbing assessment, the collected proprietary database is subsequently utilized in this thesis to provide further evidence on these important arguments. Accordingly, chapter 4 takes a closer look on demand and supply at the VC market and how both sides on the market interact. Thereby, performance consequences that arise from a mismatch of demand and supply for deal-level returns are at the core of the analysis. Chapter 5 is finally dedicated to the absence of buoyant capital markets that allow venture capitalists to exit their investments by means of IPOs. As the analysis focuses on the question how superior returns can potentially be harvested from acquisition exits, the analysis attempts to provide insights how in the absence of IPOs interesting investment returns can nevertheless be achieved. The author believes that answers to both questions are required to once more re-establish VC as a successful asset class. This way, not only investors would benefit from adequate returns, but society as a whole would keep on benefiting from the positive impacts VC provides through financing promising ventures.

4 Essay 1 - "The Performance of Venture Capital Investments: Do Investors Overreact?"

Abstract

Using a unique proprietary data set of over 5,400 realized and unrealized venture capital investments between 1980 and 2005, we examine the impact of supply-related factors, i.e. money provided by VC investors, as well as demand-related factors, e.g. entrepreneurial activity, on the return of individual VC investments. This way, we are able to shed more light on the question whether volatile VC investment returns are rather driven by fundamental changes with regard to the number of attractive investment opportunities or by overreaction by investors. We find that rising demand for VC, i.e. an increase in entrepreneurial activity, results initially in higher returns. However, our results also indicate that overreaction on the supply side can be observed, destroying deal-level results. Overfunding, specifically overinvesting seems to be a recurring characteristic of the VC industry. In fact, contra-cyclical investment strategies yield highest deal-level returns.

Keywords: venture capital, performance, overreaction, market volatility, IRR

JEL Classification Code: G24, G32

Authors: Achleitner, Ann-Kristin; Engel, Nico; Reiner, Uwe

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4.1 Introduction

Intuitively, venture capital (VC) investors are primarily interested in the financial return this asset class generates. Only if VC firms accomplish sufficient financial returns on their investments, will they be successful in raising new funds for their future investment activity (see, e.g., Kaplan and Schoar 2005). However, during the last decade in particular venture capitalists failed to generate attractive returns for their own investors. For example, by comparing four different data sources HARRIS, JENKINSON AND KAPLAN (2011) consistently show that, on average, US VC funds with vintage years in the 2000s provided negative median internal rates of returns (IRRs). A similar pattern applies when referring to (weighted) average IRRs – returns to limited partners were slightly above or below 0%. Given the riskiness of this asset class, these returns can be considered inappropriately inadequate. As a result, less optimistic industry observers start to entertain some doubt on the overall vitality of this asset class and predict a potential lasting reduction of capital funds allocated to the VC industry (Lerner 2011) – a development which could severely hamper capital supply for high-growth, innovative young ventures.

Looking at the existing literature on VC transaction returns most researchers focus on the impact of certain VC related characteristics on investment success (Cumming and MacIntosh 2003; Hochberg, Ljungqvist et al. 2007; Gompers, Kovner et al. 2008; Nahata 2008). Thereby, the majority of previous studies conclude that it is, in particular, the VC's prior experience, reputation or ability to syndicate that determines investment success. Fundamental skills to better select and monitor portfolio companies build the foundation of superior investment performance.

Beyond that, a limited amount of studies focus on market-related factors affecting VC deal-level returns. The majority of these studies analyze the relationship between the public capital market and VC performance (see, e.g., Gompers, Kovner et al. 2008; McKenzie and Janeway 2011). MCKENZIE AND JANEWAY (2011) find that VC funds conducting their investments in a competitive market and exiting those in an unfavorable market environment, exhibit a low median fund-level IRR of 4%. In contrast, when transactions were entered during times of capital shortage and realized in boom periods the median fund-level IRR was 20%.

Finally, few studies analyze the "money chasing deal" phenomenon. Gompers and Lerner (2000b) provide evidence that inflows of capital into venture funds increase the valuation of

these funds' new investments. In addition, they do not find any significant relationship to the ultimate success of these investments. However, INDERST AND MÜLLER (2004) provide additional theoretical evidence for this phenomenon. According to their model, a sufficiently strong imbalance between capital supply and demand results in relatively little value creation in these start-ups. Both studies, however, fall short in providing specific evidence on the concrete impact on investment returns.

This paper contributes to existing research on VC performance as we identify and evaluate in particular how market-related volatility impacts deal-level VC investment returns. Thereby, our analysis is less focused on the impact of volatile public markets, i.e. the availability of initial public offerings (IPOs), but on observed volatility of actual demand and supply for VC. This way, we build upon theoretical considerations by LERNER (2002a) and analyze empirically whether VC performance shows return patterns as predicted by fundamental changes on these markets ("fundamental view") or whether returns are primarily driven by overreaction of market participants ("overreaction view").

In this regard, this paper extends existing literature in several dimensions. Firstly, we consider movements in entrepreneurial activity, i.e. the demand side for venture capital, in the analysis. Hence, we do not exclusively focus on the investment performance impact of volatility on the supply side, i.e. the level of VC fund inflows. To address existing research results, we thereby closely control for changing conditions on the public capital market. Secondly, since our analysis is based on a proprietary data set from two European private equity fund-of-funds, we are able to use actual deal-level returns (based on cash flows exchanged between the VC firm and its portfolio company). The advantage of this data is threefold: Given that VC funds usually have a pre-determined lifetime of 10-12 years and an investment period of approximately five years, funds typically experience both boom and bust cycles during their lifetime. This makes it difficult to investigate the influence of market shifts on returns from a fund-level perspective in detail. As a result, deal-level analyses are particularly suitable to understand the influence of volatile markets on VC performance. Furthermore, in contrast to prior studies which commonly use the achieved exit type as proxy for investment success, our unique dataset allows us to utilize a much more accurate return measure. Cash flow based, deal-level IRRs and Cash Multiples are able to account for differences between exit types (e.g. between IPOs and trade sales) and heterogeneous investments in one exit type group (e.g. poor versus high performing trade sales). In this way, on a more general level, our study also adds to the existing

literature by providing detailed descriptive statistics on deal-level performance over time for a comprehensive sample of VC investments. In addition, our sample comprises VC deals entered between 1980 and 2005 which makes it possible to closely analyze several cycles, in particular the period after the burst of the dot-com bubble. Finally, we are able to dissect the data using both the fundamental and overreaction theory.

Overall, we find a rather positive connection between entrepreneurial activity and VC investment success. Accordingly, our empirical results confirm that VCs benefit from the continuous emergence of innovations and the respective demand for financing of entrepreneurial ideas. On the supply side, however, we find that both VC fundraising and investment activities are statistically significantly and negatively related to deal-level returns. Obviously, VCs and/or their limited partners (LPs) tend to overreact to perceived investment opportunities and, as a result, invest too much capital in relatively unattractive ventures. Intuitively, this leads to disappointing deal-level returns. Consequently, utilizing superior data on deal-level performance we obtain results that are in line with theoretical considerations from LERNER (2002a), who expected to observe overreaction behavior due to distinctive characteristics of the VC industry. Interestingly, however, our findings are in contrast to the results by GOMPERS ET AL. (2008) who find no support for the overreaction theory. Nevertheless, it is important to note that we obtain similar results if we substitute our detailed cash flow based deal-level return measures with a simple dummy success variable. This makes us confident that our results are reliable and emphasizes the importance of using very detailed performance measures when conducting deal-level analyses.

The rest of the paper is structured as followed. Section 2 introduces relevant theoretical considerations and derives testable hypotheses. Section 3 describes the construction of the utilized data sample and its representativeness. In addition, relevant dependent, independent and control variables are introduced. Section 4 analyses historical VC return patterns. Relevant market related factors are studied by means of bivariate and multivariate analyses. Section 5 summarizes and discusses our key results.

4.2 Theoretical Considerations and Propositions

Intuitively, one could argue that the volatility in the VC industry is the result of the consistent emergence of new attractive investment opportunities. This is called the *fundamental* theory throughout the paper. For example, due to technological progress new markets develop which leads to an increase in capital demand and supply in this area. In other words, an increase in VC fundraising and investment activity goes along with the emergence of new investment opportunities, i.e. a transformation that would be based on fundamental changes in an industry. Building upon previous work by POTERBA (1989), GOMPERS AND LERNER (1998) and LERNER (2002a) we utilize a simple supply and demand framework to discuss these relationships. Just as in markets for commodities such as oil and semiconductors, shifts in supply and demand shape the amount of capital raised by venture funds. Ultimately, these shifts also drive the returns that investors earn in these markets. Hence, if capital demand and supply increase proportionally, no effect on VC returns should occur. If we (reasonably) assume that there is a time gap until the capital supply adjusts, we would (even) expect higher returns due to more profitable investment opportunities throughout this adjustment period.³⁹⁹ Therefore, in line with fundamental theory, upward shifts of the VC demand curve and subsequent adjustments to VC supply, as a consequence of better investment alternatives, should in general evoke unchanged or at most temporarily enhanced investment returns.

***Hypothesis 1a:** Fundamental shifts of VC demand (i.e. entrepreneurial activity) and VC supply (i.e. VC fundraising activity) have a neutral impact on VC transaction returns*

***Hypothesis 1b:** Fundamental shifts of VC demand (i.e. entrepreneurial activity) and VC supply (i.e. VC fundraising activity) have a positive impact on VC transaction returns*

On the other hand, however, many industry observers argue that the volatility of the VC industry (especially in terms of returns) is more a symptom of overreaction rather than a response to fundamental changes made by venture capitalists and entrepreneurs on these markets

³⁹⁹In his theoretical considerations regarding boom and bust cycles in the VC industry Lerner (2002) mentions various characteristics of the venture capital investment cycle that provoke time lags during the process of responding to changing investment opportunities.

(Gupta 2000; Gompers, Kovner et al. 2008). Accordingly, the volatility of supply and demand in terms of fundraising and investment activity could be a symptom of "overshooting" by VCs (and their LPs) and entrepreneurs in reaction to perceived investment opportunities (*overreaction* theory). Accordingly, overreaction occurs, in particular, when VC firms (irrationally) associate past investment successes with future investment opportunities. Alternatively, it may stem from VCs who feel compelled to follow the herd out of concern for the reputation consequences of being contrarians (Scharfstein and Stein 1990). Therefore, during boom periods the prevalence of overfunding of particular sectors can lead to a sharp decline in terms of venture fund's effectiveness. Investments during these years grew dramatically and were concentrated in a few areas. Moreover, considerable sums were devoted to supporting very similar firms (Gompers, Kovner et al. 2008). As a result, investments especially made towards the end of boom periods seem to yield poor investment results, or are phased out as complete write-offs. Existing research using the achieved exit type as the indicator for a successful investment seems to support this relationship (Hochberg, Ljungqvist et al. 2007; Nahata 2008; Zarutskie 2010). Therefore, if investment returns are negatively affected by the expansion of VC fundraising and/or investment activity, we interpret this as evidence for overreaction behavior in the VC industry. In this case, VC investors overshoot with regard to perceived investment opportunities and end up with disappointing return realizations.

Hypothesis 2: Overreacting VC supply (i.e. VC fundraising activity) has a negative impact on VC transaction returns

Among the few studies on deal-level, GOMPERS ET AL. (2008) provide empirical support for the fundamental theory and find no robust support for the overreaction theory. They show that more experienced VC firms perform slightly better than less experienced ones during boom periods. However, since their analysis was based on transactions entered between 1975 and 1998, questions on the influence of a VC firm's experience during and after the dot.com bubble still remain unanswered.⁴⁰⁰ In addition, due to the very limited availability of data on individual

⁴⁰⁰ According to inflation-adjusted TVE industry data, the dot.com bubble years of 1999 and 2000 alone represent respectively approximately 33% for the US, and 40% for Europe of the total VC fundraising volume of the period between 1980 and 2005. This corresponds to fractions of investment volume of 36% for the US and 29% for Europe.

VC transactions, GOMPERS ET AL. (2008) had to rely on data from Thomson Venture Economics (TVE). Consequently, in line with existing literature on VC performance, they were using a dummy variable which equals one if the portfolio company was acquired, merged, or went public, and which equals zero otherwise, as a performance measure. Albeit while a certain correlation among type of exit and actual investment return can be assumed, the contractual presence of lockup periods can cause substantial return differences in particular in times of high capital market volatility. Put simply, there is no guarantee that actual rates of return (based on cash flows) will match exit valuation-based returns on investment.

4.3 The Data

4.3.1 Sample Construction & Representation

To date, existing quantitative research on VC performance is predominantly based on data provided by TVE. Only recently, researchers began to utilize alternative sources to analyze historical private equity (PE) returns, particularly for fund-level performance analysis (see, e.g., Harris, Jenkinson et al. 2011; McKenzie and Janeway 2011). HARRIS ET AL. (2011) argue that existing commercial databases suffer from systematic data biases primarily due to the voluntary nature of self-reporting. Furthermore, research on transactional level is even more restricted due to the fact that existing data sources provide aggregated returns on fund-levels only. Through the utilization of a large-scale, proprietary data set of single VC investments our study contributes to existing literature on VC performance. Given the private nature of VC, to date and to the best of our knowledge there are no comparable, large scale datasets for historical VC transaction level returns available.

Our analysis is based on a data set sourced from two leading European private equity fund-of-funds. This way, we follow recent studies that do not rely purely on self-reported data (Achleitner, Braun et al. 2011; Harris, Jenkinson et al. 2011; McKenzie and Janeway 2011). The two deal-level databases are, therefore, the result of comprehensive data collection processes. The respective fund managers utilize information on historical deal returns in order to optimize their internal asset allocation decisions. Accordingly, every time VC firms address potential investors – so-called LPs such as fund-of-funds investors – to raise new funds, they are required to provide detailed information for the investors' due diligence efforts (Achleitner, Braun et al. 2011). As a result, the databases contain anonymous deal-level information on

various characteristics of the portfolio companies that the fund-seeking VC firms have previously invested in. We exploit this data to calculate accurate, deal-level based investment performance measures. Most importantly, these data sets are assembled during the due diligence process, i.e. before the fund-of-funds' asset allocation decision. As a result, we analyze not only transactions by VC firms that these fund-of-funds finally invested in, but also those that they decided not to invest in. This way of sampling strongly reduces the issue of selective VC firm reporting (Kaplan and Schoar 2005). Nevertheless, a potential disadvantage of this sample would be if the LPs' accessible pool of VC firms is not representative (Harris, Jenkinson et al. 2011). Comparing the fundamental fund characteristics of our sample to relevant empirical studies, however, makes us feel comfortable that there is no systematic bias. Hence, these studies report comparable fund size figures as in our data set.⁴⁰¹

The final sample characteristics of our dataset are presented in Table 4-1. These characteristics are already the result of a few data cleaning and elimination processes which will subsequently be discussed. The purpose of this procedure is to increase the overall data quality. Due to limited data representation we exclude all investments in regions outside of North America and Europe. In line with GOMPERS ET AL. (2008), we do not consider any follow-up financings as the empirical results are expected to reveal the distinct characteristics of individual investment events. In this context, follow-up financings only depict duplicates of respective initial investments. Multiple investments into the same portfolio company occur frequently within VC investing. This way, investors guarantee sufficient funding until the successful exit of the portfolio company (Gompers 1995). For similar reason, we use identical cash flow profiles to eliminate all double entries among the two merged databases. Similar to COCHRANE (2005) we manually delete transactions with anomalously high returns (above an IRR of 30,000%). Almost all of these deleted transactions share a symbolic investment sum of \$1 pointing to transactions with a distinctive restructuring characteristic deviating from the regular VC investing norm. For similar reasons, we delete all transactions with total committed capital below \$10,000 and above \$250 million. Observations that fall into these categories are not considered to represent typical VC investments (see, e.g., Giot and Schwienbacher 2007). Finally, we delete any

⁴⁰¹ Smith, Pedace et al. (2010) report a non-weighted average of committed capital of \$314 million for a set of 296 conventional US VC funds. Harris, Jenkinson et al. (2011) show median (mean) size-cutoffs for their sample of 775 VC funds of \$137 (191) million for 1990s vintages and \$278 (358) million for 2000s vintages. This compares to a non-weighted average median for our full sample of \$216 million.

transactions with total holding periods below three months to avoid the impact on performance measures due to abnormally short investment periods.

Table 4-1: Sample Descriptives

This table displays descriptive statistics on 5,404 transactions completed by 128 different Venture Capital firms between 1980 and 2008. The "Entry Year" is based on the concrete date of the first cash flow from the venture capitalist to the portfolio company. The "Exit Year" is usually defined as the month of the last cash flow from the portfolio company to the venture capital firm. However, in cases where the last cash flow is considerably smaller than the adjacent previous payout, the exit date is corrected to the date of the last substantial cash flow. "Investment Size" and "Divestment Size" are the sum of all cash flows from the venture capitalist to and from the portfolio company.

Panel A: Selective GP characteristics

Number of different VC firms	128
Number of different VC funds	431
Median fund vintage year	1998
Median age of VC firm at entry date (years)	11.5
Median fund size (USDm)	204.2

Panel B: Selective investment characteristics

	N	Min	Max	Average	Median	STD
Entry Year	5,404	1980	2005			
Exit Year	5,404	1981	2008			
Holding period (years)	5,404	0.3	21.8	4.4	3.9	2.679
Investment size at entry (USDm)	5,404	0.0	234.7	8.7	4.9	15.054
Divestment size at exit (USDm)	5,404	0.0	1,534.0	14.4	3.5	47.014

Panel C: Investment distribution by country and region

North America	4,069	75.3%
US	4,020	98.8%
Canada	49	1.2%
Europe	1,234	22.8%
UK	306	24.8%
Germany	220	17.8%
France	198	16.0%
Switzerland	50	4.1%
Canada	49	4.0%
Sweden	44	3.6%
Italy	37	3.0%
Netherlands	32	2.6%
Spain	23	1.9%
Denmark	18	1.5%
Poland	18	1.5%
Austria	15	1.2%
Belgium	15	1.2%
Ireland	13	1.1%
Other European	50	4.1%
Not assigned	146	11.8%
Not specified	101	1.9%
Total	5,404	100.0%

Panel A of Table 4-1 shows relevant key characteristics of the VC firms. Accordingly, 128 different venture capitalists are part of the sample with a median VC firm age at the time of investment of 11.5 years. Overall, these VC firms manage 431 different VC funds with a median vintage year in 1998 and a weighted median fund size of \$204 million (non-weighted median of \$216 million)⁴⁰². For each deal monthly gross cash flows between the portfolio company and the VC firm are reported. Regarding other investment- and fund-related variables, the existing data is cross-checked and complemented with publicly available data from the TVE database. Consequently, missing regional or stage-specific data is completed. Syndication related information, i.e. the numbers of total investors into a portfolio company, is fully provided by TVE. Panel B summarizes the relevant descriptive statistics on transaction level for the final sample. Accordingly, the average (median) holding period for a VC investment is 4.4 (3.9) years. On average, a VC firms invests a total of \$8.7 million in each transaction. In contrast, the median investment sum of \$4.9 million is substantially lower. Looking at average and median divestment sizes this delta is even more pronounced. The average investment proceeds of \$14.4 million are significantly higher than the median of \$3.5 million. These variances provide evidence for the high heterogeneity of VC investment returns reaching from as low as zero (full write-off) to staggering high proceeds in cases of successful acquisition or IPO exits. The largest divestment realization in our sample is an impressive \$1.5 billion. Panel C, finally, shows the geographical distribution of our sample. Hence, the majority (75%) of transactions took place in North America with Europe representing approximately 23% of all investments. Within Europe, the United Kingdom (25%), Germany (18%) and France (16%) are the main contributors.⁴⁰³

⁴⁰² For the weighted median we calculate the median over our entire sample of 5,404 VC investments, i.e. the fund size of one VC fund is considered multiple times in line with the included number of fund investments. For the non-weighted median we calculate the median over our sample of 431 single fund observations only.

⁴⁰³ Similar to Lopez-de-Silanes, Phalippou, & Gottschalg Lopez-de-Silanes, et al. (2012); Lopez-de-Silanes, et al. (2012) Figure 4-2 (part of the Appendix) provides additional descriptive statistics on the distribution by performance (IRR in %), by duration (in years) and by investment size (\$ million) for our sample of fully realized VC transactions.

Table 4-2: Data Coverage for US and Europe for Period between 1980 and 2005

This table presents data coverage for Europe and the US for the period from 1980 to 2005. For the purpose of comparison we report our sample data on unique portfolio company level. Accordingly, each portfolio company is included uniquely in the year of its first VC financing. This procedure allows us to compare yearly figures to first-time investments data as reported by Thomson Reuters Venture Economics (TVE). Panel A reports coverage rates for entry years. Panel B aggregates data for five distinctive investment periods.

	US			Europe			Total		
	Sample	TVE	Cover- age	Sample	TVE	Cover- age	Sample	TVE	Cover- age
Panel A: Coverage by Entry Year									
Year									
Before 1985	128	3,649	4%	1	55	2%	129	3,704	3%
1986	30	685	4%	0	22	0%	30	707	4%
1987	49	756	6%	0	26	0%	49	782	6%
1988	41	670	6%	1	24	4%	42	694	6%
1989	29	617	5%	0	61	0%	29	678	4%
1990	27	436	6%	6	60	10%	33	496	7%
1991	49	490	10%	18	75	24%	67	565	12%
1992	50	635	8%	18	80	23%	68	715	10%
1993	70	590	12%	15	77	19%	85	667	13%
1994	74	715	10%	20	96	21%	94	811	12%
1995	94	1,218	8%	17	163	10%	111	1,381	8%
1996	127	1,626	8%	30	241	12%	157	1,867	8%
1997	149	1,959	8%	34	256	13%	183	2,215	8%
1998	211	2,472	9%	65	534	12%	276	3,006	9%
1999	382	3,075	12%	121	1,039	12%	503	4,114	12%
2000	467	4,045	12%	175	2,370	7%	642	6,415	10%
2001	190	1,653	11%	62	1,517	4%	252	3,170	8%
2002	153	1,236	12%	58	773	8%	211	2,009	11%
2003	152	1,141	13%	48	1,565	3%	200	2,706	7%
2004	202	1,332	15%	51	1,348	4%	253	2,680	9%
2005	153	1,566	10%	51	1,174	4%	204	2,740	7%
Total:	2,827	30,566	9%	791	11,556	7%	3,618	42,122	9%
Panel B: Coverage by Time Period									
Year of exit:									
1980- 1989	277	6,377	4%	2	188	1%	279	6,565	4%
1990 - 1995	364	4,084	9%	94	551	17%	458	4,635	10%
1996 - 1998	487	6,057	8%	129	1,031	13%	616	7,088	9%
1999 - 2000	849	7,120	12%	296	3,409	9%	1,145	10,529	11%
2001 - 2005	850	6,928	12%	270	6,377	4%	1,120	13,305	8%

Table 4-2 provides elementary statistics with regard to data coverage for our proprietary VC sample. Hence, we cover approximately 9% of deals reported by the TVE database for the period between 1980 and 2005 (as of February 2012). The table shows year-by-year coverage (Panel A), as well as an aggregated level for five distinct investment periods.⁴⁰⁴ We compare data on a first-time investment basis, i.e. on a single company basis. Accordingly, our sample comprises a total of 3,618 unique portfolio companies⁴⁰⁵ which compares to a total number of 42,122 for the combined US and European VC universe. Coverage for Europe (7%) falls short of the US coverage (9%) primarily due to the almost complete absence of data on European transactions before 1990. On average, coverage in the 1990s and through 2005 is generally higher than for the 1980s. With regard to industries (not shown), our sample shows a typical VC-related distribution with 38% in the internet and computer industry, 31% in biotechnology and healthcare and 20% in the communication and electronics industry. Apart from a small bias towards internet companies, the overall distribution is largely in line with comparable studies such as the one by GOMPERS ET AL. (2008). In contrast to their sample, our dataset comprises, however, a substantial amount of transactions that were made during and post the distinctive dot.com era.

4.3.2 Dependent Variable

Our main target is to analyze the impact of volatile levels of activity on the demand as well as supply side of the VC industry on deal-level investment returns and determinants behind it. Hence, our dependent variable is the transaction-specific investment performance. We measure deal-level performance from the perspective of the VC firm by using the IRR and the Cash Multiple for each deal, gross of fees and carried interest. Based on the time value of money assumption, the IRR depicts an implied discount rate of cash in- and outflows from portfolio companies that result in a net present value of zero (Osborne 2010). In general, all included investments follow a similar pattern. While negative cash flows are incurred at the beginning and throughout the investment period, positive cash flows are created at the point of exit. Hence

⁴⁰⁴ These five periods – 1980-1989, 1990-1995, 1996-1998, 1999-2000 and 2001-2005 – follow distinctive investment waves driven e.g. by favorable exit conditions at the peak of the so called dot.com bubble in the years 1999 and 2000.

⁴⁰⁵ The 3,618 unique portfolio company observations need to be compared to a total sample of 5,404 unique pairs of portfolio companies and VC firms. The latter represents our primary research objective throughout our analysis. According to the definition of TVE first-time investments, we compare for the purpose of data representation only at the level of unique portfolio companies.

the problem of "non-normal" cash flows with time varying in- and out-flows does not affect the analysis. Nonetheless, PHALIPPOU (2010) shows that the implied reinvestment assumption of the IRR methodology is a major pitfall when it comes to VC investments. Due to the fact that the IRR is heavily dependent on a VC's holding period, the resulting performance spreads between different investments overestimate volatility. To mitigate this problem, Cash Multiples serve as an alternative performance measure. Comparing the aggregated cash inflows to the realized exit gains, Cash Multiples circumvent the IRR's pitfall by capturing investment performance without regard to the underlying timeframe. Finally, in order to further mitigate the impact of extreme positive outliers for the purpose of econometric analysis only, we re-scale the performance measures for multivariate analysis. As a result, we use an IRR measure winsorized at the 1% level (99th percentile) and the natural logarithm of 1+Cash Multiple, respectively.

Both performance measures are based on all cash flows accruing between the venture capitalist and the portfolio company over the entire investment period as reported in our proprietary database. By directly using these cash flows we can take account of any potential factor influencing the cash flow to equity holders during the holding period (e.g. intermediate milestone payments or dividends). With this result, we can improve the data reliability compared to similar studies where commonly round-to-round valuations (Gompers and Lerner 2000b; Cochrane 2005; Fitza, Matusik et al. 2009) or the achieved exit type (Hochberg, Ljungqvist et al. 2007; Gompers, Kovner et al. 2009) have been used to approximate investment performances. Especially in times of high capital market volatility, the contractual presence of lockup periods can further cause substantial return differences. In other words, depending on the post-IPO share price performance, there is absolutely no guarantee that actual rates of return (based on cash flows) will match exit valuation-based returns on investment.

Table 3 reports deal-level investment performance, measured by IRR and Cash Multiple, in our sample. Thereby, Panel A summarizes descriptive statistics for realized transactions only. In contrast, Panel B presents relevant statistics for our full data sample including transactions that were not fully exited yet. For our subsample of realized transactions (Panel A) we calculate average (median) IRR returns of 28.5% (-14.0%) and average (median) Cash Multiples of 3.1 (0.5) throughout the entire sample period (entry years between 1980 and 2005). Panel B shows that for our full sample VC firms earned an average IRR of 18.7% and a median return of 0%.

This corresponds to an average Cash Multiple of 2.4 respectively 1.0. The staggering low median returns trace back to a substantial amount of transactions that failed even to return their initial investment amounts. In the absence of comparable, large-sample analyses focusing on deal-level VC performance, it is difficult to compare our results to existing studies. Due to the nature of our data set as described in section 3.1, we are, however, confident that this result is representative for the analyzed time period.

Table 4-3: Descriptive Performance Statistic by Stage, Industry and Region

This table displays descriptive investment performance statistics for 5,404 transactions between 1980 and 2005. Panel A reports results for a subsample of transactions that were fully exited or written-off. Panel B represents our full dataset including transactions that were not fully realized at the last reporting date. IRR is calculated from monthly cash flows between VC investor and the portfolio company gross of fees and carried interest in percent. Cash Multiple is the ratio of the cash inflow to cash outflow from the VC investor's perspective. Stages represent commonly used financing stage categories, i.e. seed/start-up, early, expansion, and later stage. Building upon TVE based industry subgroups, we merge proprietary industry classifications into 6 broad industry sectors, namely "Internet & Computers", "Biotechnology & Healthcare", "Communication & Electronics", "Consumer", "Industrials", "Financial Services", "Business Services" and "Others". The place of the headquarter of the portfolio company determines the regional affiliation of the investment.

Variable	N	IRR			Cash Multiple		
		Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Panel A: Realized transactions only							
	3,154	28.5%	-14.0%	4.207	3.06	0.54	13.386
By stage of portfolio company							
Seed/start-up	578	4.4%	-27.5%	2.341	3.04	0.25	8.371
Early stage	969	7.2%	-34.0%	2.269	3.08	0.19	20.080
Expansion	1,284	45.4%	0.0%	5.455	2.98	1.00	9.567
Later stage	323	68.1%	11.0%	5.378	3.33	1.47	7.212
By industry sector of portfolio company:							
Internet & Comp.	1,354	22.2%	-35.0%	3.862	2.86	0.22	10.089
BioTech. & Healthcare	699	9.0%	5.0%	1.495	2.46	1.19	3.846
Comm. & Electronics	617	61.8%	-19.0%	6.457	4.86	0.39	25.714
Consumer	170	52.4%	-6.0%	6.693	1.90	0.79	3.891
Industrials	136	10.8%	8.5%	1.080	2.02	1.44	2.681
Financial Services	57	-9.2%	6.0%	0.626	1.75	1.25	2.082
Business Services	65	78.6%	18.0%	2.536	3.45	1.70	5.553
Others	56	7.6%	-8.5%	1.230	2.37	0.75	4.347
By region							
US	2,441	21.2%	-18.0%	4.108	3.10	0.49	13.711
Europe	581	63.4%	-9.0%	4.994	2.99	0.72	13.469
Panel B: Full sample							
	5,404	18.7%	0.0%	3.235	2.37	1.00	10.442
By stage of portfolio company							
Seed/start-up	905	6.0%	-3.0%	1.928	2.57	0.87	7.650
Early stage	1,727	5.9%	-3.0%	1.728	2.32	0.91	15.137
Expansion	2,149	28.3%	0.0%	4.234	2.31	1.00	7.545
Later stage	623	39.1%	0.0%	3.896	2.40	1.00	5.442
By industry sector of portfolio company:							
Internet & Comp.	2,060	16.1%	-9.0%	3.148	2.39	0.73	8.595
BioTech. & Healthcare	1,653	5.5%	0.0%	1.020	1.82	1.00	3.020
Comm. & Electronics	1,019	40.1%	0.0%	5.054	3.44	1.00	20.116
Consumer	207	44.1%	0.0%	6.068	1.79	1.00	3.568
Industrials	195	14.0%	1.0%	1.015	1.97	1.03	3.005
Financial Services	88	-1.2%	4.0%	0.540	1.85	1.16	2.474
Business Services	93	56.1%	10.0%	2.149	2.78	1.44	4.764
Others	89	6.4%	0.0%	1.024	1.99	1.00	3.682
By region							
US	4,069	14.2%	0.0%	4.108	2.38	1.00	10.712
Europe	1,184	35.1%	0.0%	4.994	2.32	1.00	10.127

In addition to the overall performance, Table 4-3 provides deal-level performance statistics for relevant portfolio company related characteristics. Accordingly, looking at realized transactions (Panel A) only, later stage investments considerably outperform investments in earlier development phases. Hence, later stage investments earned an average (median) IRR of 68% (11%) compared to as little as 4% (-28%) for seed/start-up investments. Cash Multiples confirm this finding. This result seems to be somewhat surprising, if one considers an overall higher risk profile for seed investments due to the significantly reduced visibility of future business success. With regard to VC related industries, we find several interesting results. First of all, moderate median returns (IRRs from -35% to 18%, Cash Multiples from 0.2 to 1.7) indicate a comparable number of disappointing transactions across all industries. Beyond that, significant differences in standard deviations indicate varying return realization patterns. Hence, the industries "Internet & Software" as well as "Communications & Electronics" show the largest deviations. Given the left censored data characteristic of investment results, higher standard deviations in these industries indicate an extremely high return potential for individual transactions. In contrast, investment returns in the medical, industrial or financial services industry are significantly less volatile and consequently more predictable.

In summary, the presented descriptive statistic seems to be a true reflection of realized VC returns for the analyzed timeframe. Stage and industrial characteristics reflect the typical focus of the VC industry. Thereby, the return data mirror the extreme distribution of return realizations – a limited amount of impressive success stories can be observed alongside a large number of loss-generating investments. Finally, the comparison of return realization patterns for the period 1997-2005 reveals accounting patterns for unrealized or partially realized transactions. As discussed by LOPEZ-DE-SILANES ET AL. (2012) these investments are typically reported as "held at cost". As a result, the investment performance converges towards 0% IRR respectively Cash Multiples of 1.0x money (Panel B).⁴⁰⁶

⁴⁰⁶ To circumvent a potential performance bias as a result of this accounting treatment, we exclude any unrealized or partially realized transactions from our analysis and utilize for our base case our sub-sample of fully realized transactions only.

4.3.3 Independent Variables

For the distinction between the fundamental and overreaction theory, we utilize various market related measures. Hence, at first we analyze to what extent changes in variables that represent the demand side of the VC industry, i.e. the demand for VC by entrepreneurs, influence investment returns. As a primary measure we utilize region-specific patent data (*patent_change*) for the US and Europe provided by the World Intellectual Property Organization (WIPO)⁴⁰⁷. In line with existing research, we argue that changes in patent applications and/or patents granted reflect the actual VC investment environment. KORTUM AND LERNER (2000) find that the growth in VC fundraising was possibly triggered by an intensified patent activity during the late 1980s and 1990s. In addition, GOMPERS AND LERNER (1998) show that both industrial and academic R&D expenditure directly resulting in patenting is significantly correlated with VC activity. Another study reveals that the level of entrepreneurship is closely related to R&D expenditures, to technological opportunities, and to the number of patents (Romain and Van Pottelsberghe 2004). Thereby, throughout our analysis we deliberately focus on granted patents in order to capture VC demand changes in high quality, entrepreneurial activity. As an alternative measure for demand-focused market activity, we use the growth of the gross domestic product (*gdp_growth*). GOMPERS AND LERNER (1998) point out that there are more attractive opportunities for entrepreneurs if the economy is growing. WILKEN (1979) argues that economic development facilitates entrepreneurship as it provides a greater accumulation of capital for investments. Hence, due to the greater availability of start-up financing, but also resulting from higher income among potential customers in the domestic market, the formation of start-ups is expected to be related to societal wealth. Finally, the cyclical nature of the VC industry and its close relationship to GDP growth is also confirmed by ROMAIN AND VAN POTTELSBERGHE (2004). Instead of using patent and GDP growth data to proxy the general entrepreneurial environment, the use of existing entrepreneurial activity indices was considered.⁴⁰⁸

⁴⁰⁷ The World Intellectual Property Organization (WIPO) is a specialized agency of the United Nations. It is dedicated to developing a balanced and accessible international intellectual property (IP) system.

⁴⁰⁸ Three leading entrepreneurial activity indices could be identified. The "Global Entrepreneurship Monitor (GEM)", the "Global Entrepreneurship and Development Index (GEDI)" and the "Kaufman Index of Entrepreneurial Activity (KIEA)". Although utilizing different methodologies, all indices provide similar, country specific data on the intensity level for entrepreneurship. In contrast to GEM and GEDI that provide global data, the KIEA is focused on the US only. Data coverage for the GEM starts in 2001, for the GEDI in 2002 and for the KIEA in 1996.

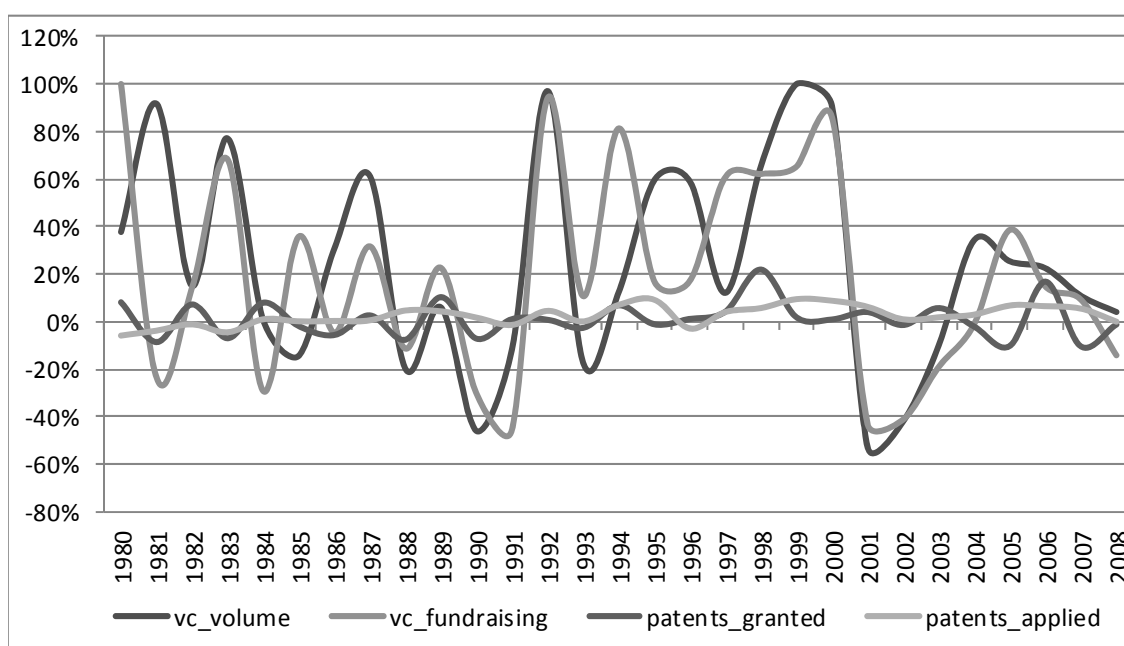
However, due to severe data limitations before the year 2000 this approach could not be pursued and leaves open opportunities for future research.

For our supply-focused analysis, i.e. the amount of money provided by VC funds, we utilize typical indicators for VC industry activity. Our primary variables are yearly data for VC fundraising (*vc_fundraising*) and VC investments (*vc_volume*). This information is provided by TVE. Both indicators form fundamental parts of the typical VC cycle and showed substantial volatility during the analyzed period (1980 – 2005). In general, fundraising represents the very first step of the VC cycle when the VC firm starts collecting capital from interested investors. Once the fund is closed, i.e. the VC firm knows the amount of total committed capital, the VC investor starts to invest these funds into numerous portfolio companies. Consequently, the amount of funds raised and the sum of total investments are highly correlated. We utilize both variables to measure investment appetite and pressure at the respective entry date of the transactions. We use aggregated data for the US and Europe as global activity data and hence focus on the impact of absolute fundraising and investment amounts.

Figure 4-1: VC Market-Related Volatility Measures by Entry Year

This table displays descriptive statistics for our major independent VC market-related activity measures. For all variables year-by-year percentage changes are presented to illustrate the general volatility of these measures. *patents_granted* and *patents_applied* represent number of patents granted respectively applied for in the US and Europe as provided by the World Intellectual Property Organization (WIPO). *vc_volume* and *vc_fundraising* represent funds raised respectively investments made by VC investors in the US and Europe. Panel A provides year-by-year changes of VC market measures for the period from 1980 to 2008. For the purpose of better illustration we limit changes to maximum of 100% for our VC activity variables. Panel B reports correlation among the utilized public market measures. Bold figures indicate significance on the 5% level.

Panel A: VC market measures over time



Panel B: Correlations of VC market measures

patents_granted	1.00											
patents_applied	0.16	1.00										
vc_fundraising	0.26	0.03	1.00									
vc_investments	0.05	0.09	0.55	1.00								
vc_ipos	-0.30	-0.22	0.13	0.40	1.00							
market_q	0.12	0.18	0.00	0.17	0.34	1.00						
lag_patents_granted	-0.44	0.06	-0.07	0.00	-0.03	-0.10	1.00					
lag_patents_applied	0.23	0.46	0.10	0.16	0.02	0.18	0.23	1.00				
lag_vc_fundraising	0.18	-0.01	-0.06	0.18	0.14	0.49	0.18	0.40	1.00			
lag_vc_investments	0.27	-0.06	0.29	0.18	0.29	0.58	0.02	0.17	0.67	1.00		
lag_vc_ipos	0.37	-0.11	0.01	-0.25	-0.30	0.21	-0.30	-0.23	0.10	0.35	1.00	
lag_market_q	0.37	0.05	-0.01	-0.17	-0.43	-0.27	0.13	0.19	0.00	0.17	0.33	1.00

Figure 4-1 provides an overview of our major independent variables for the analyzed time period. We, thereby, differentiate between our argumentation among market drivers that represent the demand side of the VC market (patent statistics) and the supply side of the VC market (fundraising and investment activity). Over the years, high volatility can be observed for all of them. Panel A, however, reveals that total volatility on the supply side is more distinctive than on the demand side. Finally, Panel B shows correlation coefficients among our market measures. In Section 4.2 we use modified measures of these variables to analyze to what extent the success of single VC transactions is affected by cyclical industry behavior.

4.3.4 Control Variables

In order to account for other potential drivers of VC transaction returns, we control for a broad set of additional variables. At first, in line with GOMPERS ET AL. (2008) we use the yearly number of VC-backed IPOs (*vc_ipos_exit*) as the measure for public market conditions. JENG AND WELLS (2000) stress that the main force behind the cyclical swings is IPO activity because it reflects the potential return to the VC/PE funds. SAHLMANN (2010) provides additional confirmation: "The ability to access public markets for the sale of primary or secondary shares is volatile. There are periods when many companies, including some low quality firms can go public and there are periods when even very successful established companies cannot go public." The overall importance of the achieved exit type within VC investing is documented by several studies that actually approximate VC success by the achieved exit route. Consequently, we add variables that represent changing conditions in the markets for IPOs at the exit date of the VC investments. As an alternative measure to the yearly frequency of VC-backed IPOs, we use industry specific market-to-book ratios (*market q*). This measure is frequently applied in investment literature as a proxy for the prevalent market attractiveness of specific sectors and, hence, represents a substitute for proxy investor appetite for public placements of VC-backed companies (Hochberg, Ljungqvist et al. 2007; Gompers, Kovner et al. 2008).

Despite being similar with regard to major industry characteristics, prior academic studies identified several interesting differences between the US and European VC market (Hege, Palomino et al. 2009). In recent years, more and more research tried to analyze even further differences among major European countries (Groh, Von Liechtenstein et al. 2010). Other studies focus on variances among different legal, political or financial systems (Bottazzi, Da Rin et al. 2009; Cumming, Schmidt et al. 2010). In our analysis of VC performance and its dependency

on relevant market related factors, we control for these differences. Hence, we include a regional dummy variable (d_{region}) indicating whether the venture is based in the US or Europe. Beyond that CUMMING, FLEMING, & SCHWIENBACHER (2006) find that a country's legal environment has a positive influence on venture capital exits. Accordingly, based on LA PORTA ET AL. (1998) and BERKOWITZ ET AL. (2003) we control for the legality ($legal_index$) in a country, which measures the quality of a country's legal system. Next to the legal environment, few studies discuss the potential impact of the presence of government-related VC investors on a country's entrepreneurial activity as well as general VC fundraising activity (Lerner 1999; Armour and Cumming 2006; Brander, Du et al. 2010). Looking at this literature, existing studies fail to provide an explicit answer to the fundamental question whether governmental VC (GVC) activity supports a country's general VC activity ("crowding-in" effect) or rather interferes with it ("crowding-out" effect). In the absence of suitable data to account for this consideration, we utilize country fixed-effects and an approximation of a country's GVC activity in our robustness section to control for this potential influence.

In addition, we control for several other portfolio company related characteristics. This way, we account for potential endogeneity issues regarding different ex-ante investment qualities (Cumming 2008; Brau, Sutton et al. 2010). To control for effects at the portfolio company-level, we utilize financing stage categories to control for company quality. Theory suggests that stage financing provides real options to abandon a project which alleviates agency problems (Hege, Palomino et al. 2009). Consequently, a higher frequency of milestones and financing rounds should translate into a more effective use of the abandonment decision, and hence smaller agency costs and better investment performance (Gompers 1995). We resort to commonly used financing stage categories, i.e. *seed/start-up*, *early*, *expansion*, and *later stage*. As an additional portfolio company-related control variable we include its industry affiliation⁴⁰⁹.

Furthermore, we include the total number of previously completed investments (*experience*) of the relevant VC firm as well as the fund size (*fund_size*) of the respective fund vehicle at the time of the investment as a proxy for experience and reputation. Among others, KAPLAN AND

⁴⁰⁹ To build on a meaningful number of transactions per industry, we follow a similar approach to Gompers et al. (2008) as we at first allocate proprietary industry information to 20 TVE based industry subgroups and subsequently merge these categories into 6 broad industry sectors, namely "Internet & Computers", "Biotechnology & Healthcare", "Communication & Electronics", "Consumer", "Industrials", "Financial Services", "Business Services" and "Others".

SCHOAR (2005) find evidence of strong performance persistence within the private equity industry. Ultimately, historical success enables investment managers to raise subsequent funds. In this context, previous deal experience and fund size represents a proxy for advanced investment skills which allow not only better access to the most promising projects but also more efficient monitoring of the portfolio companies throughout the investment period. We calculate VC experience in line with GOMPERS ET AL. (2008). Accordingly, we use a relative, logarithmic measure of previous deal experience that accounts for average deal experience of the VC industry at the time of the investment. Further, we control for the impact of VC *syndication*. CUMMING, FLEMING, & SCHWIENBACHER (2005a) provide evidence that the syndication size of an investment fluctuates with the liquidity conditions on IPO exit markets. Other literature suggests that syndication should lead to improved investment screening by securing a second opinion in the due diligence process (Casamatta and Haritchabalet 2007). Syndication is represented by the total number of different VC firms that invested in the portfolio company throughout the entire investment period. With regard to the consistent pursue of a predetermined investment strategy, CUMMING, FLEMING & SCHWIENBACHER (2009) find evidence of a positive relationship between style drifting (*style_drift*) and investment performance. To this regard, we utilize their concept of large style drifts to account for the impact if the fund manager's investment activity deviates from the stated focus on particular stages of entrepreneurial development.

We also include exit year categories to control for general time trends within the VC industry (Kaplan and Schoar 2005; Gompers, Kovner et al. 2008). In addition, we use vintage year fund-level IRRs (*vintage_irr*) and Cash Multiples (*vintage_cm*) as reported by TVE to further account for the effect of vintage performance related factors. Finally, the results of previous studies indicate that a VC's holding period (*holding_period*) is related to the exit success rate as well (Cochrane 2005). We define the holding period as the number of months from the beginning of an investment until its exit. However, in cases where the last cash flow is considerably smaller than the adjacent previous payout, the exit date is corrected by using the time of the last substantial cash flow. The reasons for smaller subsequent cash flows can be earn out related payments in the case of acquisitions or the sell-off of smaller stock packages in succession to the primary public listing event.

4.4 Boom and Bust Cycles and Venture Capital Performance

4.4.1 Bivariate Results

We start our analysis whether VC investment returns are a response to fundamental changes regarding investment opportunities or driven by overreaction behavior with the presentation of historical investment return patterns. Therefore, Table 4-4 summarizes transaction performance for investment entry years as well as aggregations for five distinctive time periods. Again, Panel A represents data for our subsample of fully realized transactions only, whereas Panel B provides results for our total sample. Looking at the chronological sequence of median investment returns, a high volatility of VC investment returns becomes apparent. For our realized subsample the yearly median returns ranges from as low as -77% (in 2003) to as high as 32% (in 1991). Aggregated data for five distinct time periods also reports high return volatility. Looking at the subsample of realized deals (Panel A), the period (1996-1998) ahead of the technology bubble at the beginning of the new millennium showed an impressive average IRR of 87% (median of 6%), followed by investments foregone during the bubble years (1999-2000) which returned on average merely 11% and a disappointing median of -69%. Wilcoxon-Mann-Whitney tests on the equality of IRRs and Cash Multiples for subsequent investment periods consistently confirm differences at the 1% level both for the realized subsample as well as the full data set.

Table 4-4: Yearly Investment Performance for the Period 1980 - 2005

This table displays descriptive investment performance statistics for 5,404 transactions between 1980 and 2005. Panel A reports results for a subsample 3,154 of transactions that were fully exited or written-off. Panel B represents our full dataset including transactions that were not fully realized at the last reporting date. IRR is calculated from monthly cash flows between VC investor and the portfolio company gross of fees and carried interest in percent. Cash Multiple is the ratio of the cash inflow to cash outflow from the VC investor's perspective. Investment performance is reported by entry dates and five distinct time periods (1980-1989, 1990-1995, 1996-1998, 1999-2000, 2001-2005). The equality of subsequent investment performance across time periods is tested by means of Wilcoxon-Mann-Whitney tests. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. For equality tests we winsorize our performance measures at the 99th percentile.

Variable	N	IRR				Cash Multiple			
		Mean	Median	WMW	Std. Dev.	Mean	Median	WMW	Std. Dev.
Panel A: Realized transactions only									
By year									
1980	4	46%	16.0%		149%	4.37	1.86		6.36
1981	28	4%	2.5%		65%	6.27	1.27		17.37
1982	32	-1%	-1.0%		60%	2.40	0.82		4.20
1983	28	-23%	-10.0%		62%	2.29	0.48		4.81
1984	40	-14%	-5.0%		55%	2.27	0.66		4.34
1985	25	-6%	1.0%		44%	1.87	1.08		2.90
1986	36	7%	0.0%		63%	2.10	1.01		2.51
1987	57	6%	12.0%		64%	3.58	1.80		5.54
1988	70	2%	13.5%		51%	2.86	2.26		3.54
1989	58	-4%	3.0%		50%	2.21	1.17		3.01
1990	66	24%	17.5%		85%	2.87	1.98		3.84
1991	113	39%	32.0%		78%	4.19	2.90		5.38
1992	94	27%	10.5%		85%	3.53	1.46		5.65
1993	135	37%	31.0%		87%	5.15	1.93		7.51
1994	131	15%	10.0%		80%	3.24	1.50		4.52
1995	139	22%	7.0%		151%	3.81	1.25		8.27
1996	187	39%	6.0%		233%	9.45	1.37		47.97
1997	202	60%	11.0%		288%	5.07	1.44		12.47
1998	300	136%	1.5%		620%	4.76	1.07		10.95
1999	496	77%	-59.5%		873%	1.65	0.10		4.39
2000	537	-49%	-76.0%		101%	0.58	0.02		1.27
2001	161	-39%	-52.0%		62%	1.14	0.07		2.11
2002	97	35%	-5.0%		361%	1.51	0.84		1.82
2003	64	4%	-77.0%		153%	1.62	0.06		2.90
2004	45	36%	19.0%		162%	2.82	1.08		5.87
2005	9	102%	52.0%		251%	1.68	1.23		1.77
By time periods									
The 80's: 1980-1989	378	-2%	3.0%		59%	2.86	1.20		6.13
Early 90's: 1990-1995	678	27%	18.5%	(+)	101%	3.90	1.81	(+)	6.34
Pre-bubble: 1996-1998	689	87%	6.0%	(-)	456%	6.12	1.28	(-)	26.90
Bubble: 1999-2000	1,033	11%	-69.0%	(-)	612%	1.09	0.04	(-)	3.22
Post-bubble: 2001-2005	376	0%	-46.5%	(+)	211%	1.53	0.26	(+)	2.92

Table 4-5: Yearly Investment Performance for the Period 1980 – 2005 (Continued)

This table displays descriptive investment performance statistics for 5,404 transactions between 1980 and 2005. Panel A reports results for a subsample 3,154 of transactions that were fully exited or written-off. Panel B represents our full dataset including transactions that were not fully realized at the last reporting date. IRR is calculated from monthly cash flows between VC investor and the portfolio company gross of fees and carried interest in percent. Cash Multiple is the ratio of the cash inflow to cash outflow from the VC investor's perspective. Investment performance is reported by entry dates and five distinct time periods (1980-1989, 1990-1995, 1996-1998, 1999-2000, 2001-2005). The equality of subsequent investment performance across time periods is tested by means of Wilcoxon-Mann-Whitney tests. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. For equality tests we winsorize our performance measures at the 99th percentile.

Variable	N	IRR				Cash Multiple			
		Mean	Median	WMW	Std. Dev.	Mean	Median	WMW	Std. Dev.
Panel B: Full sample									
By year									
1980	4	46%	16.0%		149%	4.37	1.86		6.36
1981	28	4%	2.5%		65%	6.27	1.27		17.37
1982	32	-1%	-1.0%		60%	2.40	0.82		4.20
1983	28	-23%	-10.0%		62%	2.29	0.48		4.81
1984	40	-14%	-5.0%		55%	2.27	0.66		4.34
1985	25	-6%	1.0%		44%	1.87	1.08		2.90
1986	36	7%	0.0%		63%	2.10	1.01		2.51
1987	57	6%	12.0%		64%	3.58	1.80		5.54
1988	70	2%	13.5%		51%	2.86	2.26		3.54
1989	58	-4%	3.0%		50%	2.21	1.17		3.01
1990	66	24%	17.5%		85%	2.87	1.98		3.84
1991	113	39%	32.0%		78%	4.19	2.90		5.38
1992	97	25%	10.0%		84%	3.45	1.36		5.58
1993	142	35%	29.0%		86%	4.97	1.93		7.37
1994	147	16%	12.0%		77%	3.62	1.58		5.06
1995	155	22%	7.0%		143%	4.05	1.25		8.24
1996	211	37%	6.0%		220%	8.77	1.37		45.22
1997	251	49%	7.0%		260%	4.39	1.36		11.30
1998	401	104%	-2.0%		540%	4.00	0.89		9.80
1999	722	55%	-27.0%		726%	1.69	0.28		5.43
2000	904	-31%	-28.0%		92%	0.75	0.27		1.21
2001	437	-20%	-11.0%		46%	1.11	0.69		1.90
2002	352	11%	0.0%		191%	1.32	1.00		1.33
2003	340	7%	0.0%		74%	1.43	1.01		1.71
2004	382	17%	0.0%		75%	1.55	1.00		2.55
2005	306	13%	0.0%		68%	1.19	1.00		0.72
By time periods									
The 80's: 1980-1989	378	-2%	3.0%		59%	2.86	1.20		6.13
Early 90's: 1990-1995	720	27%	17.5%	(+)	98%	3.98	1.83	(+)	6.39
Pre-bubble: 1996-1998	863	72%	2.0%	(-)	410%	5.28	1.10	(-)	24.16
Bubble: 1999-2000	1,626	7%	-28.0%	(-)	490%	1.16	0.27	(-)	3.76
Post-bubble: 2001-2005	1,817	5%	0.0%	(+)	103%	1.32	1.00	(+)	1.80

Table 4-6: Investment Performance Terciles for Different Time Periods

The table presents data for our subsample of 3,154 realized VC transactions exited between 1982 and 2008. Panel A reports median and mean IRR performance terciles for five distinct time periods. Panel B reports median and mean cash multiple performance terciles for the same periods. Panel C shows box plots for deal-level IRRs for the five distinct investment periods.

Panel A: IRR

(i) Median Returns

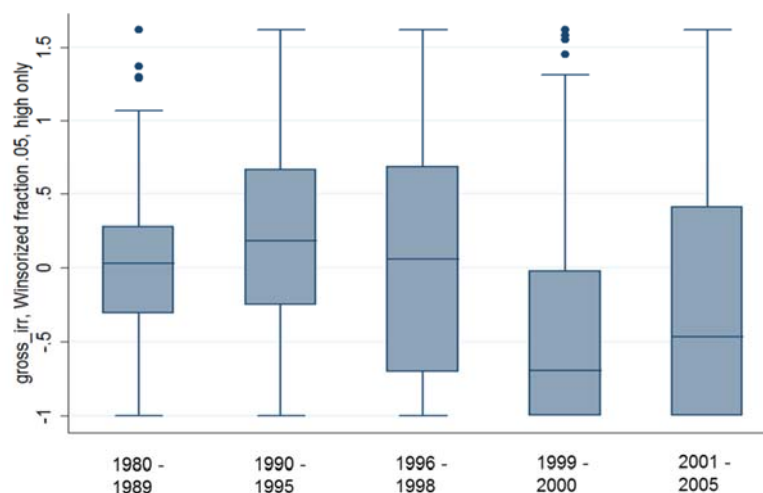
Observations	378	678	689	1,033	376	3,154
	1980-1989	1990-1995	1996-1998	1999-2000	2001-2005	All Periods
Bottom Tercile	(61.0%)	(50.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)
Medium Tercile	3.0%	19.0%	6.0%	(67.0%)	(46.0%)	(14.0%)
Top Tercile	47.0%	98.0%	159.0%	16.0%	61.0%	64.0%

Panel B: Cash Multiples

(i) Median Returns

Observations	378	678	689	1,033	376	3,154
	1980-1989	1990-1995	1996-1998	1999-2000	2001-2005	All Periods
Bottom Tercile	0.03	0.05	0.00	0.00	0.00	0.00
Medium Tercile	1.20	1.85	1.29	0.08	0.32	0.55
Top Tercile	4.95	7.26	6.29	1.73	3.10	4.17

Panel C: Box plot of deal-level IRRs by time periods (winsorized at the 95th percentile)



In general, we observe multiple years with only moderate median returns below 10% or even negative performance. In particular, the bubble (1999-2000) and post-bubble (2001-2005) periods are characterized by a substantial increase in investments that failed to return any positive return at all. Most interestingly, this is accompanied by substantially increased standard deviations, in particular starting in the mid-1990s. Standard deviations for deal-level IRRs are relatively narrow ranging from 44% to 87% prior to 1995. Subsequently, this measure rises continuously to 873% in 1999 and remains at relatively high levels (above 100%) until the end of the analyzed period. A similar pattern with regard to standard deviations can be observed for realized Cash Multiples, although slightly less pronounced. These numbers are obviously the result of shifting return patterns. For different sets of data HARRIS, JENKINSON ET AL. (2011) show similar characteristics for fund-level returns. Table 4-5 provides further evidence for this development by showing median returns for investment performance terciles as well as box plots for our pre-defined time periods. Clearly, the evolution of return distribution indicates an increasing spread caused by a movement towards few very successful investments and a majority of value-destroying transactions (Panel A to Panel C). SAHLMAN (2010) confirms this trend towards higher rates of mortality (especially during the remarkable internet bubble) and links it to tremendously increased VC activity fueled by shining early internet success stories. Consequently, this increasing majority already represents an indication of overreaction behavior. Simply matching improved fundamental investment opportunities would probably not have led to such return deteriorations.

Table 4-7: Investment Performance and Market Volatility Measures

This table presents data for our subsample of 3,154 realized VC transactions exited between 1982 and 2008. Tercile 1 to 3 represent activity terciles for our major independent market activity measure variables. Panel A reports median performance measures for entry year patent activity (year-on-year percentage change). Panel B reports median returns for entry year VC fundraising activity. Results are presented for the change of yearly fund inflows to the VC industry (i) and for the year-on-year percentage change of fund inflows (ii). The equality of investment performance across activity terciles is tested by means for Kruskal-Wallis tests. *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively. For equality tests we winsorize our performance measures at the 99th percentile.

Panel A: Patents Granted - Year-on-Year % Change

	<i>Observations</i>	<i>IRR</i>	<i>Cash Multiple</i>
1 st Tercile (lowest)	1,074	0.0%	1.00
2 nd Tercile	1,182	-50.0%	0.11
3 rd Tercile (highest)	898	4.0%	1.23
<i>Kruskal Wallis p-value</i>		0.00***	0.00***

Panel B: VC Fundraising

(i) VC Fundraising - Yearly Fund Inflows

	<i>Observations</i>	<i>IRR</i>	<i>Cash Multiple</i>
1 st Tercile (lowest)	1,056	12.0%	1.59
2 nd Tercile	1,400	-22.0%	0.50
3 rd Tercile (highest)	698	-72.5%	0.03
<i>Kruskal Wallis p-value</i>		0.00***	0.00***

(ii) VC Fundraising - Year-on-Year % Change of Fund Inflows

	<i>Observations</i>	<i>IRR</i>	<i>Cash Multiple</i>
1 st Tercile (lowest)	1,213	7.0%	1.32
2 nd Tercile	1,147	-20.0%	0.50
3 rd Tercile (highest)	794	-47.0%	0.12
<i>Kruskal Wallis p-value</i>		0.00***	0.00***

Table 4-7 adds to this initial descriptive discussion and provides bivariate performance statistics with regard to our major independent variables. We assign our sample of realized transactions into terciles based on our primary measures for VC demand and supply (Panel A and Panel B). As a result, we obtain three groups ranging from the group of transactions in periods with the lowest to those with the highest level of market activity. With regard to our entrepreneurial activity measure (granted patents), we obtain interesting results (Panel A). Even if we do not find support for a linear relationship between patenting activity and returns, highest median returns can be observed for years in those with the strongest increase in patenting activity. This indicates that VCs benefit from intensified entrepreneurial activity which opens up interesting investment opportunities. The Kruskal-Wallis tests for the IRR and Cash Multiple, reported at the bottom of Panel A, statistically confirm the inequality of the investment performance among these activity terciles.

As regards VC fundraising activity we find even more explicit results. In line with our presumption, investment returns clearly deteriorate with an increasing level of fundraising activity: The median IRR (Cash Multiple) of 12% (1.59) drops significantly from years with the lowest fundraising volumes to -73% (0.03) in years with the highest fund inflows (Panel B, (i)). This result strongly supports our prediction and points towards substantial overfunding in the VC industry. Apparently, there is a mismatch of available funds and entrepreneurial projects worth funding. In other words, as a consequence of substantial increases in fundraising, VC investors – eager to put their committed capital at work – seem to experience difficulties in identifying and investing in successful business models. This finding is confirmed if we use year-on-year percentage change figures instead of absolute fundraising flows (Panel B (i)). Again, the Kruskal-Wallis test statistics for inequality in deal-level IRRs and Cash Multiples among VC fundraising-related activity groups are significant at the 1% level.

Hence, on the basis of our bivariate analysis we find evidence that supports our initial predictions regarding the existence of both the fundamental as well as overreaction theory within VC investing. Overall, however, the pattern related to the overreaction theory seems to be more robust and consistent. On this point, however, the question remains, whether the identified negative relationship between VC fundraising and investment returns results from systematic investment overreactions or is primarily determined by the prevailing condition in the capital markets, i.e. public investor interest in young high-tech companies. To answer this question, the subsequent section presents results from multivariate analysis.

4.4.2 Multivariate Analysis

In this section, we conduct multivariate regressions to investigate the impact on investment performance for our identified market-related volatility measures. This way, we analyze to what extent investment success is driven either by fundamental market adjustments or by overreaction behavior. Table 4-8 reports regression results for our subsample of realized transactions exited between 1982 and 2008. We start by separately testing the impact of demand for and supply of VC. Both variables – the yearly percentage change in granted patents (*patent_change*) as well as yearly capital flow to the VC industry (*vc_fundraising*) – measure activity levels at the respective time of the investment entry.

Table 4-8: Regression Analysis – Investment Performance and Market Volatility

The table displays ordinary least squares regression results with heteroskedasticity-consistent standard errors on the determinants of investment performance using a sample of 3,154 realized VC transactions completed between 1980 and 2008. If not indicated otherwise, information is retrieved from our proprietary data set. *IRR*, our performance measure in models (1) to (5), is calculated from monthly cash flows between VC firms and the corresponding portfolio company gross of fees and carried interest. It is the discount rate that equates the present value of these cash flows to zero. *Cash Multiple*, our performance measure in model (6), is calculated by dividing the total cash inflows from the perspective of a VC firm by the total cash outflows. Both performance variables are winsorized at the 99th level to account for extreme outliers. *IRR_SUC* and *CM_SUC* are dummy variables that take the value 1 if the respective investment generates positive returns, i.e. an IRR greater than 0 or Cash Multiple greater than 1. *EXIT* represents a dummy variable that is 1 if the transaction was exited by means of an IPO or an acquisition and 0 otherwise. *patent_change* is the year-on-year change of granted patents within the respective region (Europe or US) of the investment in question. *vc_fundraising* represents the natural logarithm of inflation adjusted amount of venture capital raised by funds in the year prior to the investment. *vc_ipos_exit* represent the yearly number of VC-backed IPOs for US and Europe in the exit year. Model (5) shows results for a restricted subsample of transactions that were not exited during the bubble period (1999-2000). In all these models (1) to (9) we control for our full set of portfolio company, VC firm as well as VC industry related effects (see Appendix I for detailed specifications). In models (6) and (8), in which we use Cash Multiple as our performance measure, we also control for the holding period (the no. of years the investor is invested in the portfolio company). Alternating number of observations are caused by limited data availability for certain control variables. *, ** and *** indicate p-values of 10 percent, 5 percent and 1 percent significance level, respectively.

VARIABLES	(1) IRR	(2) IRR	(3) IRR	(4) IRR	(5) IRR	(6) CM	(7) IRR_SUC	(8) CM_SUC	(9) EXIT
patent_change	1.079*** (0.315)		1.409*** (0.343)	1.160*** (0.264)	0.104 (0.444)	-0.041 (0.145)	0.637 (0.460)	1.081 (0.751)	0.460 (0.579)
vc_fundraising		-0.243** (0.109)	-0.323*** (0.099)	-0.162* (0.098)	-0.290*** (0.100)	-0.106* (0.060)	-0.349** (0.174)	-0.390* (0.225)	-0.167 (0.179)
vc_ipos_exit				0.528*** (0.081)	0.417*** (0.095)	0.263*** (0.033)	0.686*** (0.072)	0.733*** (0.137)	0.502*** (0.085)
vintage_irr				0.336 (0.216)	0.205 (0.270)		-0.008 (0.363)		0.799** (0.319)
vintage_cm						-0.020 (0.018)		-0.013 (0.070)	
experience				-0.023 (0.025)	-0.023 (0.026)	-0.009 (0.016)	-0.048 (0.053)	-0.042 (0.052)	-0.003 (0.047)
fund_size				0.025 (0.041)	0.004 (0.045)	0.004 (0.025)	0.105 (0.068)	0.003 (0.078)	0.272*** (0.080)
syndication				-0.002 (0.006)	-0.003 (0.004)	-0.000 (0.005)	-0.007 (0.010)	0.002 (0.017)	0.011 (0.014)
legal_index				0.065 (0.046)	0.078 (0.069)	0.007 (0.031)	-0.016 (0.090)	0.084 (0.071)	-0.043 (0.076)
d_generalist				-0.049 (0.085)	-0.040 (0.096)	-0.067 (0.051)	-0.181 (0.185)	0.028 (0.164)	-0.480*** (0.084)
style_drift				-0.090 (0.076)	-0.107 (0.074)	-0.114** (0.046)	-0.266** (0.132)	-0.300 (0.222)	-0.354*** (0.125)
holding_period						-0.041** (0.016)		-0.666*** (0.092)	
constant	-0.106 (0.138)	2.662** (1.286)	3.640*** (1.165)	-1.750 (1.478)	-0.045 (1.789)	0.677 (0.959)	0.166 (2.708)	-0.990 (2.984)	-1.008 (2.748)
Stage	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	3154	3154	3154	2757	2130	2757	2757	2714	2400
R-squared	0.076	0.076	0.082	0.166	0.141	0.207			
Pseudo R-squared							0.150	0.304	0.114

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Model (1) shows that granted patents have a statistically significant (1% level) and positive influence on deal-level IRR. This result supports our prediction that better investment opportunities improve the return potential for VC investors. In times of high growth in qualitative patenting (above the hurdle of being granted), VC investors are likely to benefit from these conditions as documented by significantly improved investment IRRs (Hypothesis 1b). Specifications (3) and (4) confirm this result as we control for fundraising activity, the exit environment and other introduced control variables which we utilize throughout the analysis.⁴¹⁰ Considering our base case specification (4), a one-standard deviation change in granted patent activity is accompanied by an increase deal-level IRRs by 0.085 standard deviations, i.e. in economic terms by 11.9 percentage points. Our additional model specifications, however, moderate this finding to some extent. Interestingly, once we drop investments that were foregone during the peak of the dot.com bubble (specification (5)) the impact is reduced and loses its statistical significance. Furthermore, we do not find statistically significant relationships with regard to our alternative performance measures, although a mostly overall positive relationship is confirmed. Model (6) shows regression results for Cash Multiples, in model (7) and (8), we introduce a logit model to test the probability of return-dependent outcomes. Therefore, *IRR_SUC* and *CM_SUC* represent dummy variables that take the value 1 if the respective investment generates any positive returns at all ($IRR > 0\%$ or $Cash\ Multiple > 1x$). In model (9) we finally use an exit type related proxy for transaction success, i.e. this dummy is 1 if the transaction was exited by means of an IPO or an acquisition and 0 otherwise.

As regards VC fundraising activity, we find a negative impact on deal-level IRR. Looking at the different model specifications (models (1) to (8)), VC fundraising, in particular, seems to have a robust, statistically significant (1% and 10% level) and consistently negative influence on returns (Hypothesis 2). For our base specification (4), our results suggest that the IRR drops by 4.6 percentage points for every change of fundraising activity by one standard deviation. Intuitively, exit conditions are also an important factor when explaining investment returns. However, obviously even favorable exit markets seem not to be able to absorb all those overfunded ventures. Nevertheless, we note that favorable exit conditions have overall a strong impact on investment results. Hence, deal-level IRRs improve by as much as 6.7 percentage points for every increase of IPO activity by one standard deviation. Model (5), eventually, provides

⁴¹⁰ Appendix I provides a detailed overview of definitions for utilized dependent and independent variables as well as relevant control measures.

evidence that this result is not predominantly driven by the exceptional bubble years. Dropping 1999 and 2000 investments results in an even higher negative impact of fundraising activity on IRR (a one-standard deviation of VC fundraising reduces IRR by 8.2 percentage points). For our alternative performance measure, Cash Multiple (model (6)), we likewise observe a statistically significant negative influence, even though with reduced economic substance. Finally, models (7) through (8) confirm that VC fundraising consistently has a statistically significant and negative impact on investment outcomes for our alternative performance measures. Only when we use an exit type related proxy for transaction success (model (9)), does VC fundraising lose its significant influence. This is interesting as this result is in line with Gompers et al. (2008) who find no statistically significant influence of VC fundraising on investment outcomes if investment success is approximated by the achieved exit type.

Overall, we see a rather positive connection between entrepreneurial activity and VC investment success (*Hypothesis 1b*). This indicates, that VC as an asset class benefits from innovations and related defensible property rights. Thereby, we need to mention that we do not raise the explicit question on causality here, i.e. whether VC investing is rather driven by innovations or vice versa (Kortum and Lerner 2000). Additionally, however, we find robust evidence for the overreaction phenomenon (*Hypothesis 2*). High fund inflows to the VC industry seem to be a remarkably clear predictor for deteriorating investment success. In line with previous arguments, overfunding seems to be a highly relevant feature of the VC industry, primarily caused on the supply side of this market. Looking at our bivariate and multivariate results, entrepreneurial ideas could not keep the pace with monetary funding into new and existing VC funds. As a result, the vast majority of VC investments turned out to deliver mediocre returns, providing evidence for the existence of systematic overreaction. Interestingly, this finding goes along with the observation that VCs invest into very narrow sectors for distinctive periods of time. Apparently, VCs continue to allocate too much funding into too few areas where they expect to generate the most promising returns. In the end, the overall potential of this area is substantially overestimated (or overloaded), causing return patterns as identified in our representative sample.

4.4.3 Robustness Checks

Table 4-9 introduces additional specifications to test the robustness of our results. Panel A addresses selection bias in the context of the analysis of VC returns. To this point, we run regressions for our subsample of fully divested transactions only. CUMMING AND WALZ (2010),

however, comment on a potential selection bias from this procedure. Heckman two-step sample selection (Heckman 1979) is applied in models (1) to (3) deal with this issue. In the first step, the probability that the transaction will be fully exited is measured. Having controlled for the exit status, we simply conduct the same analyses as in the previous single regression set-up. The results show that even if we account for unrealized or partially realized transactions, higher fundraising activity leads to lower VC investment returns. Again, this finding is confirmed for both alternative performance measures (IRR and Cash Multiple). For our entrepreneurial activity measure (patents), however, we obtain mixed results. Hence, we continue to observe a significant positive impact for our base case specification (1). Excluding transactions made during the bubble years of 1999 and 2000 (specification (2)) and for the Cash Multiple as alternative performance measure, we observe a rather neutral and insignificant impact. For all specifications our capital market condition proxy (IPOs) continues to show a strong positive impact on deal-level returns.

Table 4-9: Regression Analysis – Robustness Checks

The table presents Heckman corrected results as well as ordinary least squares regression results with heteroskedasticity-consistent standard errors on the determinants of investment performance using a sample of 3,154 Venture Capital (VC)-backed acquisition completed between 1982 and 2008. Models (1) to (3) report Heckman results for models (4) to (6) as reported in Table 8 and utilizes the same set of variables as defined in Table 8. The first step of the Heckman correction includes all variables from the second step as well as the holding period of the investment (in years) for identification. Models (4) to (9) represent variations of our basic OLS specifications as presented in Table 8 to test for robustness. Alternative variables are defined as presented in Appendix I. Alternating number of observations are caused by limited data availability for certain control variables. *, ** and *** indicate p-values of 10 percent, 5 percent and 1 percent significance level, respectively. In the lower rows standard errors are reported.

VARIABLES	Heckman Correction Models					
	(1)		(2)		(3)	
	1 st step	2 nd step	1 st step	2 nd step	1 st step	2 nd step
patent change	0.161 (0.357)	1.072*** (0.321)	4.369*** (0.606)	-0.181 (0.426)	0.340 (0.357)	-0.019 (0.200)
vc_fundraising	0.510*** (0.067)	-0.321*** (0.078)	0.581*** (0.070)	-0.393*** (0.071)	0.515*** (0.067)	-0.166*** (0.049)
vc_ipos_exit	-0.199*** (0.033)	0.546*** (0.032)	-0.227*** (0.037)	0.440*** (0.034)	-0.202*** (0.033)	0.311*** (0.020)
constant	-3.044*** (1.098)	0.876 (1.168)	-4.054*** (1.177)	1.750 (1.119)	-3.282*** (1.102)	1.369* (0.736)
controls	YES	YES	YES	YES	YES	YES
Uncensored obs.		2757		2130		2757
Censored obs.		1731		1571		1731
Mills lambda		-1.068***		-0.671***		-0.440***
Chi-Squared		1772.68***		1380.04***		1817.74***

VARIABLES	Heckman Correction Models					
	(4)	(5)	(6)	(7)	(8)	(9)
	IRR	IRR	IRR	IRR	IRR	IRR
patent change			1.180*** (0.261)	0.951*** (0.238)	1.117*** (0.268)	1.031*** (0.225)
patent_change_apl	1.344** (0.622)					
vc_fundraising	-0.175 (0.113)	-0.157 (0.126)				-0.167 (0.110)
vc_fundraising_c			-0.132 (0.084)			
vc_volume				-0.244*** (0.090)	-0.204*** (0.077)	
vc_ipos_exit	0.525*** (0.079)	0.550*** (0.081)	0.527*** (0.081)		0.529*** (0.080)	
gdp_growth		0.026 (0.021)				
market_q_entry						0.043** (0.021)
market_q_exit						0.204*** (0.050)
constant	-1.185 (1.717)	-1.577 (1.841)	-1.690 (1.334)	1.440 (1.359)	-0.852 (1.263)	-0.356 (1.528)
controls	YES	YES	YES	YES	YES	YES
Observations	2757	2647	2757	2757	2757	2734
R-squared	0.163	0.168	0.166	0.077	0.168	0.109

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Panel B of Table 4-9 shows additional regression results that contribute to the robustness of our findings. In specifications (4) to (9) we utilize variations of our most important independent variables. In specifications (4) and (5) we use alternative proxies for our demand-focused measures. Once we substitute our measure for granted patents to patent applications or use country-specific GDP growth as an alternative measure, our results do not materially change.

In specification (6) we substitute the prior year fundraising numbers to current year figures. As indicated in section 4.2 (Table 4-7), for our basic framework we use prior year fund inflows to account for typical characteristics of the VC industry. Unlike in liquid markets such as public equity or bond markets where shares can be bought and sold easily (Lerner 2002a), investment decisions in the VC industry usually require several months in order to complete due diligence processes and complex term sheet negotiations. Using current numbers instead, however, does not change our findings. Finally, if we increase the granularity of our activity measures by using approximated last twelve months (LTM) numbers ahead of the investment date, our results again are not materially different (not shown).

Specifications (7) and (8) use global investment volumes instead of fundraising activity as a measure for supply-side volatility in the VC industry. As expected due to the high correlation between fundraising and subsequent investments, we obtain comparable results. In specification (9) we ultimately substitute the number of IPOs by industry-specific market-to-book (market Q) values at the respective investment and exit dates. Here, we follow GOMPERS ET AL. (2008) who use both alternatives (IPOs and market Qs) for public market measures in their study. Once again and in contrast to their finding, we find a significant relationship for this market measure. Interestingly, we find a positive coefficient for entry date related market Qs. High entry price levels seem to have no deteriorating impact on VC transaction success. This needs, however, to be interpreted with caution: the market Q measure may not accurately reflect the shifts in public investors' appetite for VC-backed firms both because it uses data on mature public companies (even though these previously, at least partially, may have been financed by VC) and because there is limited potential for an inexact matching process within the outlined industry classification mechanism. In order to specifically address the potential influence of different levels of GVC investors, we include country-specific dummies into our base case specification. Alternatively, we utilize country-specific percentages of GVC involvement as introduced by BRANDER ET AL. (2010). None of these alternative specifications change our re-

sults meaningfully (not shown). Finally, once we control for the right-skewness of our performance data through the utilization of a logarithmized measure of IRR (not shown) our findings are again not materially changed. We conclude that, overall, our findings seem to be robust regarding potential selection bias and for changing market measures.

4.5 Conclusion

Boom and bust cycles are an important feature of VC markets (see, e.g., Lerner 2002a). This paper investigates the influence of market shifts on deal-level VC returns and the determinants behind this relationship. Thereby, we deliberately distinguish between demand- and supply-related factors as well as their interaction.

We provide evidence that deal-level IRRs are partially driven by fundamental changes regarding the number of attractive investment opportunities, i.e. the number of high-quality startups which are associated with higher returns for the VC firm. Interestingly, this even holds when we control for increasing fundraising activity, and thereby increasing investment pressure, as a response to improved investment opportunities. Furthermore, prudent consideration of prevailing exit conditions at the time does not change our findings. However, we only find robust evidence for this relationship when using deal-level IRRs as the performance measure. For Cash Multiples and a dummy variable, indicating whether a transaction was written-off or exited via an IPO/ trade sale, we find no statistically significant relationship. Overall, this is somewhat in line with recent evidence from GOMPERS ET AL. (2008) who show that (more experienced) VCs increase their investment activity during boom periods with no performance deterioration, i.e. in response to improved investment opportunities. They argue that shifts in public markets provide information which is then used by (experienced) VCs toward deciding how much money to successfully invest in what areas.

On the other hand, our results unambiguously show that both fundraising and investment activities, both measures for the supply side of the VC market, are statistically significantly and negatively related to deal-level returns. Obviously, VCs (and/or their LPs) tend to overreact to perceived investment opportunities and, as a result, provide too much capital. This, while in contrast to the findings by GOMPERS ET AL. (2008), does support fund-level return findings by previous studies (Kaplan and Lerner 2010). In this context, it is important to note that we obtain similar results to those of GOMPERS ET AL. (2008) if we substitute our detailed cash flow based deal-level return measures by a simple success variable (IPO/sales versus write-offs). We think

that this emphasizes the importance of using very detailed performance measures when conducting deal-level analyses.

In summary, we conclude that VC deal-level returns show strong interdependence with the respective funding environment. Our dataset reveals that excess supply of VC, i.e. the potential overfunding by VC investors relative to the resulting investment allocations, is a good predictor for decreasing investment returns. Apparently, the term 'excess supply' in this context needs to be handled carefully and always be compared to existing demand. Consequently, we assume two primary reasons behind this relationship. At first, evoked by a few extremely successful transactions, venture capitalists continue to allocate too much capital into sectors with overall too little potential for attractive returns. Interestingly, this is often at the expense of other industry sectors, which potentially languish underfunded outside of the periodical investment focus. Even worse, overfunding usually goes hand in hand with a reduced capability to select and monitor, i.e. providing diluted management support for portfolio companies (Kanniainen and Keuschnigg 2004). For the same reason LERNER (2002a) challenges the general scalability of the VC business model.

Looking forward, we expect competitive VC investment returns only to reoccur if (i) diminished fund inflows reduce excess liquidity above available investment opportunities or (ii) significantly improved investment conditions from radical new inventions or technologies emerge. A third, although substantially less assessable avenue (from the perspective of the VC firm) would be the return of extremely receptive capital markets as witnessed at the peak of the dot.com era. Considering this, it will be interesting to observe whether a reduction in supply will be either driven by LPs, frustrated by achieved returns on their VC allocations, or by a process of "self-limitation" by VC firm managers who voluntarily limit the size of their future funds raised. In the meantime, VC firms should cautiously assess contrarian investment strategies as the most promising approach to achieve attractive investment returns.

In summary, we think that this study sketches out some paths for future research on VC deal-level returns and their connections to general market conditions. Assuming a general "going forward" scenario for the VC asset class, it will be interesting to see whether return distributions will revert to patterns as observed in the early years of the VC industry, when more favorable supply-and-demand dynamics lead to more attractive VC risk-return profiles (Lerner 2011). Furthermore, despite a general convergence of global VC market characteristics (in particular

on the supply side), global differences in fundamental economic dynamics could reveal additional support for our results (for example, an assessment of deal-level investment return characteristics in potentially less developed areas or emerging markets is desirable, and existing research to date has been limited to very much more restricted data availabilities). Finally, we suggest the close monitoring of current as well as future developments in the market for informal VC activity, i.e. funds provided by family/friends and/or business angels. As this source of entrepreneurial funding becomes more and more important and professional, a comparison of deal-level investment returns associated with volatile market conditions seems of interest.

Table 4-10: Appendix 1 – Definition of Variables

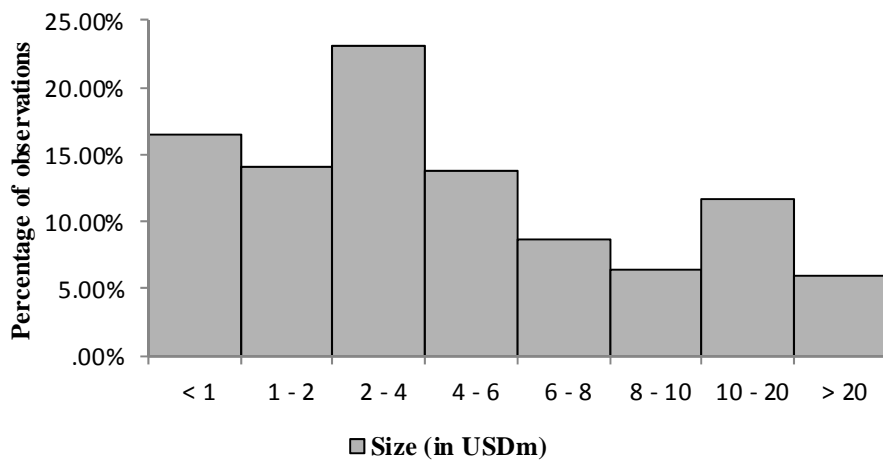
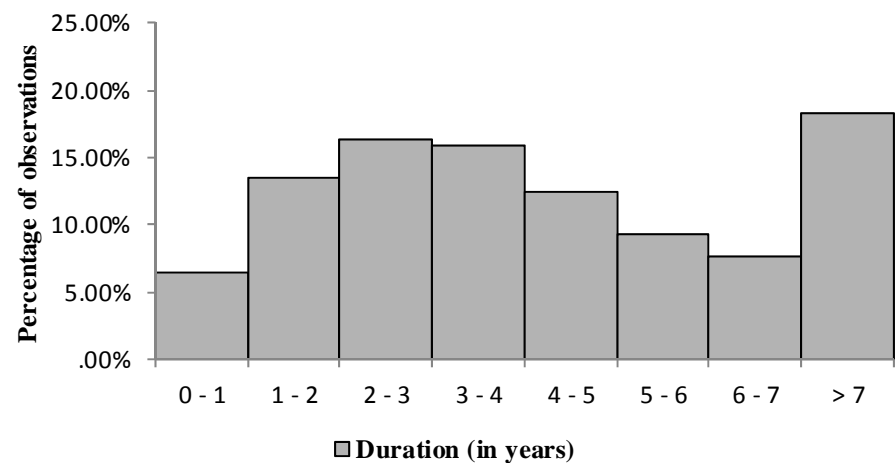
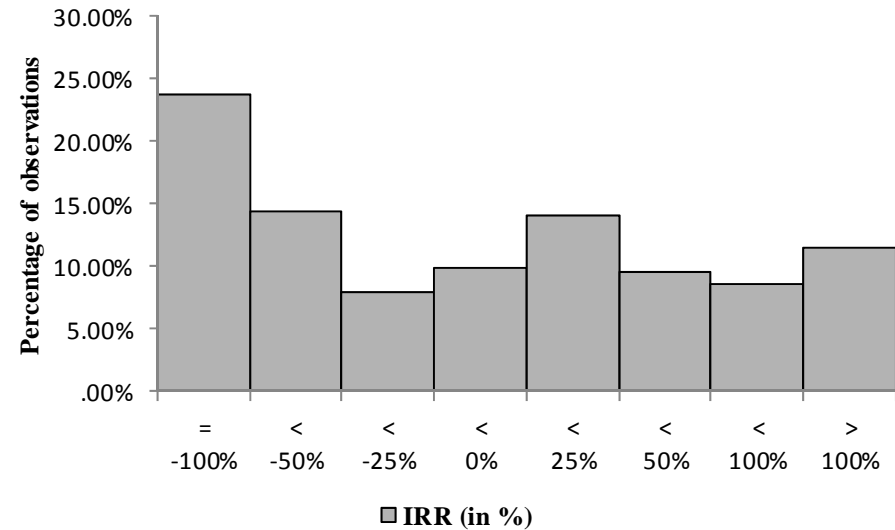
<u>Dependent Variables – Performance Measures</u>	
IRR	IRR is calculated from monthly cash flows between VC firms and the corresponding portfolio company gross of fees and carried interest. It is the discount rate that equates the present value of these cash flows to zero (reported in %)
Cash Multiple	Cash Multiple for each transaction is calculated by dividing the total cash inflows from the perspective of a VC firm by the total cash outflows
<u>Independent Variables – Market Activity Measures</u>	
patent_change	Yearly percentage change of granted patents for the region of the investment in the year of the investment
patent_change_apl	Yearly percentage change of patent applications for the region of the investment in the year of the investment
vc_fundraising	Natural logarithm of fund commitments (USDm) to the VC industry in the year prior to the investment date
vc_fundraising_c	Natural logarithm of fund commitments (USDm) to the VC industry in the year of the investment
vc_volume	Natural logarithm of global venture capital investments (USDm) in the year prior to the investment date
vc_ipos_exit	Natural logarithm of the number of venture capital backed IPOs in the exit year of the investment
market_q_entry	Following GOMPERS ET AL. (2008), market q is the average ratio of the market value of the firm to book value of assets (M/B) for public companies in the same industry of the respective investment in the year of the investment
market_q_exit	Following GOMPERS ET AL. (2008), market q is the average ratio of the market value of the firm to book value of assets (M/B) for public companies in the same industry of the respective investment in the year of the exit
gdp_growth	Yearly growth rate of the growth domestic product (GDP) for the region of the investment in the year of the investment
<u>Control Measures</u>	
VC Industry Related	
vintage_irr	Median VC vintage year IRRs in the year of the investment date. Regional split for US and Europe.
vintage_cm	Median VC vintage year Cash Multiple in the year of the investment date. Regional split for US and Europe.

<u>Control Measures (Continued)</u>	
Transaction Related	
seed/start-up	A dummy variable which is set to equal 1 if the venture was at the seed or start-up stage, 0 otherwise
early	A dummy variable which is set to equal 1 if the venture was at the early stage, 0 otherwise
expansion	A dummy variable which is set to equal 1 if the venture was at the expansion stage, 0 otherwise
later stage	A dummy variable which is set to equal 1 if the venture was at the later stage, 0 otherwise
Internet & computers	A dummy variable which is set to equal 1 if the venture is in the computer or internet industry, 0 otherwise
biotech & healthcare	A dummy variable which is set to equal 1 if the venture is in the biotech or healthcare industry, 0 otherwise
cce	A dummy variable which is set to equal 1 if the venture is in the communication or computer equipment industry, 0 otherwise
consumer	A dummy variable which is set to equal 1 if the venture is in the consumer related industry, 0 otherwise
industrials	A dummy variable which is set to equal 1 if the venture is in the industrial industry, 0 otherwise
financial services	A dummy variable which is set to equal 1 if the venture is in the financial service industry, 0 otherwise
business services	A dummy variable which is set to equal 1 if the venture is in the business service industry, 0 otherwise
others	A dummy variable which is set to equal 1 if the venture is in any other industry, 0 otherwise
experience	Following GOMPERS ET AL. (2008), 'experience' is the difference between the log of one plus the number of investments made by the VC firm prior to the investment date and the log of one plus the average of the number of investments made by all firms prior to the investment date.
fund_size	Natural logarithm of fund size expressed in USDm
syndication	The number of total investors up to the exit of the company
legal_index	The weighted average of the LA PORTA ET AL. (1998) legal variables. Weights used are as in BERKOWITZ ET AL. (2003). The index includes the Rule of Law, Efficiency of the Judiciary, Contract Repudiation, Risk of Expropriation and Corruption. Higher numbers indicate better legal systems. The range is from 11.8 to 21.9.

Transaction Related (Continued)	
d_generalist	A dummy variable which is set to equal 1 if the venture capitalist follows no development stage related investment strategy, 0 otherwise
style_drift	Following CUMMING, FLEMING & SCHWIENBACHER (2009), style drift is a dummy variable that indicates whether the entrepreneurial development stage of the investment is in line with the stated investment focus of the fund manager.
holding_period	Number of years a VC firm held a portfolio company, i.e. the time span between entry and exit date in years
period 1980 - 1989	A dummy variable which is set to equal 1 if the investment was made between 1980 to 1989, 0 otherwise
period 1990 - 1995	A dummy variable which is set to equal 1 if the investment was made between 1990 to 1995, 0 otherwise
period 1996 - 1998	A dummy variable which is set to equal 1 if the investment was made between 1996 to 1998, 0 otherwise
period 1999 - 2000	A dummy variable which is set to equal 1 if the investment was made between 1999 to 2000, 0 otherwise
period 2001- 2005	A dummy variable which is set to equal 1 if the investment was made between 2001 to 2005, 0 otherwise
region	A dummy variable which is set to equal 1 if the venture is located in Europe, 0 otherwise

Figure 4-2: Appendix 2 – Distribution of Performance, Duration and Size

This figure shows histograms of IRR (in %), investment duration (in years), and investment size (equity invested in USDm) for our sample of 3,154 realized transactions. The first bar of each histogram includes all observations in the threshold or below. The last bar of each histogram includes all observations above the threshold.



5 Essay 2 – “Industry Relatedness in Trade Sales and Venture Capital Investment Returns”

Abstract

We investigate relationships between the industry relatedness of venture capital-backed companies and their strategic acquirer in trade sales and the achieved investment returns of venture capitalists. Using a proprietary data set of 716 trade sales, we analyze return differences between lateral and synergetic trade sales, as well as between horizontal and vertical trade sales. We find that venture capitalists achieve higher returns with lateral rather than with synergetic trade sales, and that the difference is greater for deals involving early-stage companies characterized by strong information asymmetries. In addition, horizontal trade sales yield higher returns than vertical trade sales; however, in boom phases of the venture capital market this effect reverses. Finally, we find that experienced venture capitalists are able to overcome disadvantageous situations in trade sales, resulting in comparable returns across all trade sale categories.

Keywords: Trade sale, venture capital, venture capital exit, industry relatedness, investment rate of return

JEL Classification Code: G24, G31, M13

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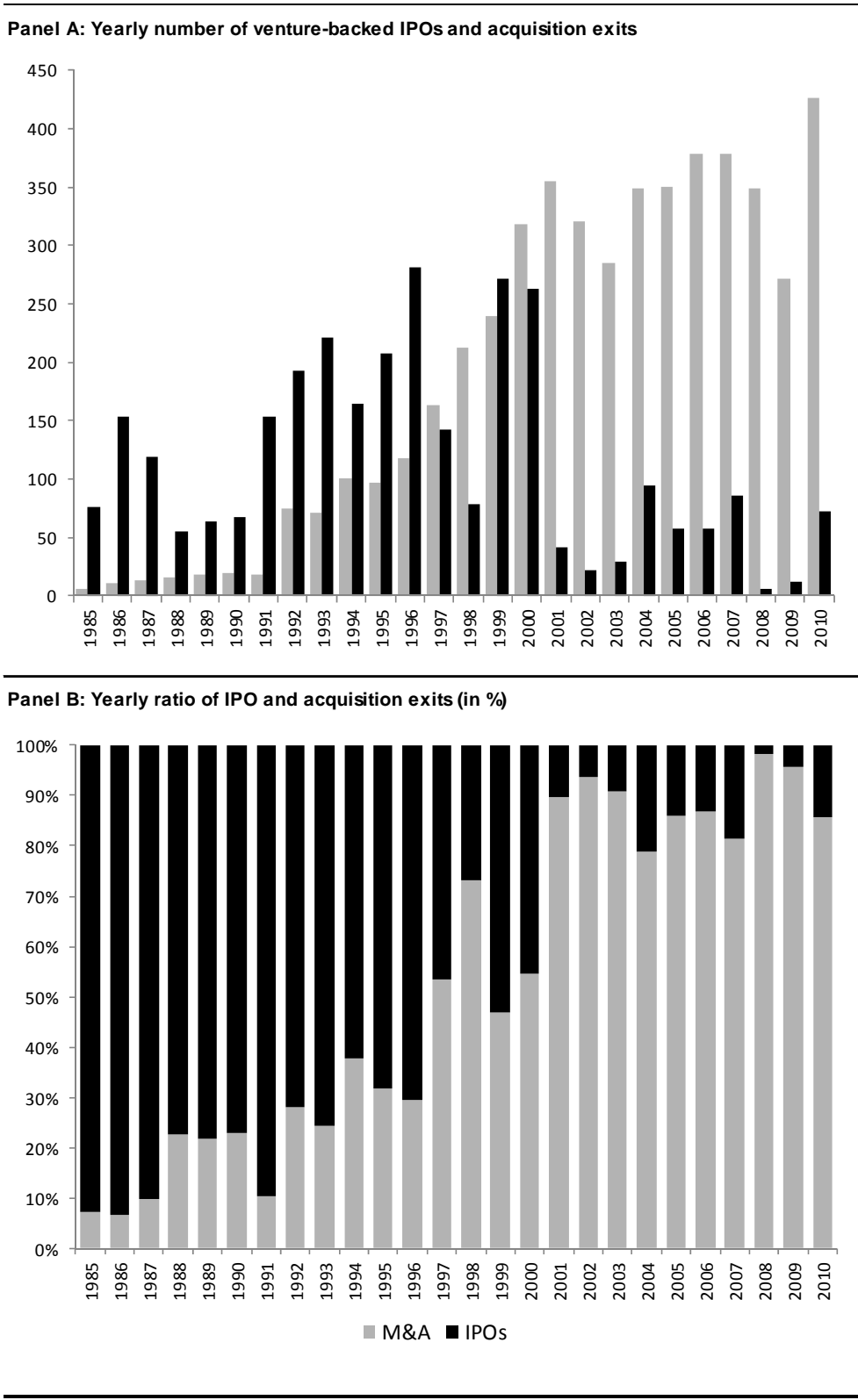
Current Status: Under Revision (2nd Round) in *Small Business Economics: An Entrepreneurship Journal*

5.1 Introduction

For venture capitalists, exiting from investments is of pivotal importance, because a successful exit is the prerequisite for attractive returns and lays the ground for future fundraising. In recent years, turbulence in public capital markets has made it difficult to realize an initial public offering (IPO), and trade sales became the dominant exit route for venture capitalists. Panel A of Figure 5-1 reports the number of IPO and acquisition exits of US venture-backed companies for the period 1985 to 2010, as provided by the National Venture Capital Association (NVCA). The number of acquisitions increased steadily throughout this period and the ratio between IPOs and trade sales inverted throughout these years, with acquisitions representing about 80% of total exits between 2001 and 2010 (Panel B). Some scholars even proclaim a new venture capital cycle characterized by acquisition exits rather than IPOs (Mendoza and Vermeulen 2011). In the US, for example, only 72 venture-backed IPOs were undertaken in 2010, whereas 427 venture-backed acquisitions were closed (NVCA 2011). The discrepancy for Europe in 2010 was even higher. According to recent data from the European Venture Capital Association (EVCA), 272 acquisitions were completed, alongside only 5 IPOs (EVCA 2011). Despite this dominance by acquisitions, they have not yet received much attention in the literature. In particular, while trade sales are recognized to be heterogeneous in terms of their return potential for venture capitalists (Cumming and Johan, 2008a; Giot and Schwienbacher, 2007), business scholars thus far have paid limited attention to examining the drivers of return differences in trade sales. Our aim is to tap into this research gap by analyzing industry relatedness between trade buyer and portfolio company as one driver of return difference in trade sales.

Figure 5-1: IPO versus Acquisition Exits of VC-Backed Companies (US)

This figure shows the absolute number of IPOs and acquisition exits (Panel A) and the resulting ratio of IPO and acquisition exits for the period 1985–2010 in the US. Data provided by the National Venture Capital Association (NVCA).



Industry relatedness is a commonly accepted dimension for distinguishing mergers and acquisitions (M&A) transactions in the literature (Lubatkin 1987; Datta, Pinches et al. 1992; Healy, Palepu et al. 1997). Industry relatedness matters for venture capital trade sale exits, as ex ante information asymmetry between trade buyer and venture capitalist varies contingent on the similarity of portfolio company and acquirer industry. Similarly, we argue that the expected ex post value created for the buyer by integrating the portfolio company depends on how closely their industries are related.

In accordance with industry relatedness theory, we distinguish between lateral and synergetic trade sales. In lateral trade sales, the trade buyer does not yet operate in the same industry as the portfolio company, while in synergetic trade sales, the buyer is already active in the same or a similar field of business. We further differentiate synergetic trade sales into trade sales where the trade buyer and the portfolio company operate in the same process step on the value chain (horizontal trade sales), and where they are active in different process steps along a value chain (vertical trade sales). We develop hypotheses on how these different levels of industry relatedness in trade sales are related to venture capital investment returns.

In addition, we argue that the return differences to venture capital firms are subject to contextual factors, i.e., returns may vary contingent on venture capital-specific characteristics of the transaction. To account for these effects, we pursue a multilevel approach that identifies factors at the portfolio company, venture capital firm, and venture capital market levels that may be relevant in explaining return differences. More precisely, we examine whether the development stage of the venture, the experience of the venture capitalist, and the general venture capital market environment have a moderating influence on return differences between trade sales types.

Our unique, proprietary data set contains 2,355 North American and European venture capital deals realized between 1982 and 2008, of which 716 are trade sales. To the best of our knowledge, ours is one of the very few (if any) large-scale data sets with deal-level information on cash flows between venture capital firm and the portfolio company, allowing us to calculate deal-level performance measures, i.e., returns from each transaction to the venture capital firm. In this way, we go beyond most previous studies, which must resort to alternative proxies for deal-level performance, for example, round valuations (Cochrane 2005). Further, we observe detailed information on the strategic acquirer of the venture capital-backed companies, allowing us to examine industry relatedness. Finally, we believe that obtaining this information from due

diligence documents of two fund-of-fund investors, which also cover venture capital funds in which the investors ultimately did not invest, substantially reduces the potential positive selection bias inherent in many publicly available venture capital data sets (Harris, Jenkinson et al. 2011). This is reflected in the high number of write-offs and negative median return to venture capitalists in our data set.

We find that venture capitalists can leverage the higher information asymmetries of lateral trade buyers and achieve higher investment returns with lateral than with synergetic trade sales. This return difference is particularly strong in transactions involving early-stage ventures, where information asymmetries are even higher. Further, we show that within synergetic trade sales, venture capitalists can benefit from distinct collusive and operational synergies of horizontal trade buyers to reach higher returns with horizontal compared with vertical trade sales. However, experienced venture capitalists are able to use their experience and reputation to make up for disadvantageous bargaining positions when selling a company and, as a result, they obtain comparable returns to all trade sales. Overall, our findings suggest that industry relatedness in trade sales is one determinant of venture capital investment returns.

The remainder of this paper is structured as follows: In Section 2, we introduce our theoretical background and develop our hypotheses. Section 3 presents the proprietary data set and variables. Section 4 presents statistical tests regarding venture capital firm return differences among types of trade sales, and Section 5 discusses findings and implications. Finally, Section 6 sets forth our conclusions.

5.2 Theoretical Background and Hypotheses

5.2.1 Trade Sale Exit Strategy of Venture Capitalists

The exit decision is critical for venture capitalists because, by achieving attractive returns for their investors, they lay the groundwork for raising additional capital in the future (Gompers and Lerner 2004). Venture capitalists can choose from a number of alternative exit routes.⁴¹¹ Sale of the portfolio company to a strategic buyer, a so-called trade sale, is one option. Other exit strategies include IPO, sale to a financial buyer, or buy-back by the entrepreneur. Scholars have

⁴¹¹ This paper focuses on venture capital exit returns independent of who is actually responsible for the ultimate exit decision (venture capitalist versus entrepreneur). See, among others, Boot et al. (2006) and Wall and Smith (1997) for more information on the actual exit decision making process.

portrayed trade sales as a second-best exit option to IPOs because venture capitalists, on average, achieve lower returns with trade sales than with IPOs (Cumming and Johan 2008a; Giot and Schwienbacher 2007; Gompers 1995).

However, this view ignores advantages of trade sales for venture capitalists. At the end of a fund’s lifetime, the venture capitalist is under increased pressure to distribute returns to investors (Wang and Sim 2001). A venture capitalist is usually able to realize an immediate and complete exit via trade sales, whereas an IPO involves a prolonged holding period, due to lockup periods.⁴¹² A trade sale may therefore be the preferred exit option (Brau, Francis et al. 2003).

In addition, for many portfolio companies an IPO is not an option, due to their small firm size and/or early stage of development (Pagano, Panetta et al. 1998; Poulsen and Stegemoller 2008; Johan 2010). In these circumstances, trade sales offer the opportunity to integrate the portfolio company into a larger organization, where it might add to the achievement of strategic objectives (Wang and Sim 2001). Hence, trade sales are suitable for a wide range of portfolio companies at different stages of development and success. It is intuitive to assume that this heterogeneity also applies to the realized returns of the venture capitalist. However, theoretical knowledge as well as empirical evidence on underlying mechanisms that drive returns of trade sales as an exit channel are limited. Our aim is to close this research gap by analyzing whether the relatedness of the portfolio company industry with the acquiring firm industry affects the return to venture capitalists.

5.2.2 Venture Capital Return Differences and Industry Relatedness in Trade Sales

In trade sales, the divestment success of venture capitalists depends on the willingness of the acquirer to buy the portfolio company, the acquirer’s valuation, and the price determination process. Regarding the buyer’s value perception, we argue that industry relatedness in trade sales has an influence on (i) ex ante information asymmetry between the trade buyer and the venture capitalist, and (ii) expected ex post value created for the buyer by integrating the portfolio company. Both these factors should have an impact on the buyer’s willingness to pay and, thereby, on the investment return achieved by the venture capitalist (Capron and Shen 2007).

⁴¹² Most IPOs feature so-called “lockup” agreements, which bar insiders from selling the stock for a set period following the IPO, usually 180 days (see Bradley, et al. (2001)). However, institutional investors might accept not only cash, but also share distributions (Johan and Najjar (2012)). Some trade sales may include earn-out agreements that might also prolong the holding period of the venture capitalist after an acquisition.

Regarding industry relatedness, trade sales can be grouped into lateral trade sales and synergetic trade sales. In lateral trade sales, the venture capitalist sells the portfolio company to a strategic buyer operating in an industry not related to the industry of the portfolio company. In contrast, synergetic trade sales involve a trade buyer already active in an industry similar to that of the portfolio company. In lateral trade sales, information asymmetries between the trade buyer and the venture capitalist are likely to be higher than in synergetic trade sales, due to the buyer’s unfamiliarity with the industry (Cumming and MacIntosh 2003). If the trade buyer already has a line of business in a similar or even in the same industry, it should be easier for the trade buyer to evaluate the portfolio company’s success and future value potential (Capron and Shen 2007). Since more familiar acquirers have less of an information disadvantage in price negotiations than unfamiliar acquirers, they are likely to be tougher negotiation partners for venture capitalists. This may translate into lower venture capital investment returns achieved with synergetic than with lateral trade sales.

Lateral acquisitions often occur in industries with high market entry barriers, as the buyer is able to gain access to an industry that would otherwise be difficult to enter (Martin and Sayrak 2003). A diversification strategy accomplished by a lateral trade sale can enable the buyer to enter innovative product markets and to initiate radical change in its business activities. Usually, the business models of venture capitalists’ portfolio companies are built around an innovative product or service with high growth potential. The strategic buyer may not be in the position to enter these innovative markets with activities from within its own organization (Granstrand and Sjölander 1990). In comparison with synergetic trade sales, lateral trade sales offer greater potential to generate strategic gains through entry into new and innovative markets. Venture capitalists can potentially use the higher information asymmetries of lateral trade buyers and the strategic advantage of entering into a new market in their negotiations to increase the price paid for the venture. This would imply higher investment returns of lateral over synergetic trade sales.

However, according to the resource-based view, potential other sources for value gains in acquisitions include collusive and operational synergies (Chatterjee 1986). Collusive synergies refer to an increase of market power in the combined entity and, hence, the ability to increase revenues by charging higher prices (Bradley, Desai et al. 1988). Further, operational synergies can emerge due to economies of scale or efficiency gains from combination of complementary resources (Martynova and Renneboog 2008). In lateral trade sales, these synergetic value gains are limited, which should reduce the willingness of the trade buyer to pay a high price for the

venture. Nevertheless, we expect that venture capitalists can use the relatively high information asymmetries of the buyer and the positive effect of gaining access to new markets in price negotiations with lateral trade buyers, thereby counteracting the limited potential to achieve synergies. It remains an empirical question whether venture capitalists achieve higher returns with lateral or synergetic trade sales, but we expect that returns from synergetic trade sales are lower than from lateral trade sales:

Hypothesis 1: *Venture capital investment returns are lower if the venture is sold to a synergetic rather than a lateral buyer.*

Given the diversity in synergies that can be gained through synergetic trade sales, we further differentiate them according to industry relatedness into horizontal and vertical trade sales. In horizontal trade sales, the buyer is active in the same line of business as the portfolio company, whereas in vertical trade sales, the portfolio company operates in related business segments along the value chain of the trade buyer (Lubatkin 1987). Sales to suppliers (backward integration) or customers (forward integration) are possible forms of vertical trade sales. The more fine-grained differentiation between horizontal and vertical trade sales allows us to examine whether a venture capitalist can take advantage of certain types of synergies that a buyer can gain from the trade sale, and realize superior returns with either form of synergetic trade sale.

As the trade buyer is already active in the same or a similar field of business, horizontal as well as vertical buyers already have in-depth industry knowledge prior to the transaction (Poulsen and Stegemoller 2008), and ex ante information asymmetries are likely to be low. However, post transaction, these two synergetic trade sale types offer distinct value creation potential for the buyer, which should be reflected in their willingness to pay and, hence, translate into differing return potential for venture capitalists.

In horizontal trade sales, collusive and operational synergies are expected to be higher than in vertical trade sales. Collusive synergies may be gained by the buyer in horizontal trade sales through an increase in market share. In addition, through an increase in the scope of business activities, cost reductions can be achieved by using shared resources and production capabilities. By scaling up production, the horizontal trade buyer is able to achieve cost savings not only in terms of dispersion of fixed costs over higher volumes, but also through additional learning-curve effects. The combination of complementary resources potentially enables the trade buyer to develop innovations (Capron 1999). In the context of venture capital–financed businesses, which are typically innovative high growth ventures, horizontal trade buyers can enhance their

innovation capability within their field of business and gain access to new technologies (Behnke and Hültenschmidt 2007). In addition, horizontal trade sales offer the opportunity to increase geographic reach by buying an entity active in a different region or country. Recent venture capital exits, such as the acquisition of MyCitydeal by Groupon, are examples of this kind of geographic expansion of horizontal trade buyers. Venture capitalists should be able to leverage these synergy gains in their price negotiations and achieve higher investment returns with horizontal trade sales than with vertical trade sales.

Hypothesis 2: *Venture capital investment returns are lower if the venture is sold to a vertical rather than a horizontal buyer.*

5.2.3 Moderating Factors for Venture Capital Return Differences in Trade Sales

The relationship between industry relatedness in trade sales and venture capital investment returns may be influenced by additional factors concerning the development stage of the portfolio company, the experience of the venture capitalist, or the general market environment for venture capital exits. Therefore, we examine factors in all three of these areas that might enhance or mitigate venture capital investment return differences between lateral and synergetic trade sales, as well as between horizontal and vertical trade sales.

Venture development stage

On the level of the portfolio company, the company development stage is likely to have an influence on return differences of trade sales. Venture capitalists usually exit their investment two to seven years after initial investment (Cumming and Johan 2008b). The time to exit realized by venture capitalists is shown to be relatively heterogeneous for trade sale exits (Giot and Schwienbacher 2007). Trade sale exits may occur in an early development stage, as the portfolio companies are not required to survive stand-alone post exit. In addition, trade sale exits are an option for portfolio companies in the later stages of company development that are not able to present an adequate equity story required for a successful IPO (Cumming and Johan 2008a). Given the relatively high variance in the maturity of candidates for trade sales, we analyze whether the stage of development of the venture has an impact on venture capital investment return differences of trade sales under differing levels of industry relatedness.

First, the more mature a portfolio company becomes, the lower are the inherent information asymmetries of a potential trade buyer as to the future success of the venture (Gompers 1995). Early-stage ventures have a short performance record (Tyebjee and Bruno 1984) and buyers are

faced with relatively high uncertainties regarding supply and demand of the venture’s product or service (Sapienza and Gupta 1994; Elango, Fried et al. 1995). This higher risk of buying a venture capital financed company in an early development stage is likely to be more relevant for lateral than for synergetic trade buyers. The latter are active in the same or similar fields of business and are able to base their buying decision on their industry experience. For lateral buyers, it is more difficult ex ante to judge the value creation potential of an early-stage venture. Venture capitalists can potentially use this higher informational disadvantage of lateral trade buyers compared to synergetic trade buyers in price negotiations.

Second, early stages of venture development are likely to influence ex post value creation potential for the trade buyer. Potential synergy gains are stronger if the portfolio company is already in a more mature stage, e.g., with developed production facilities and sales networks. In synergetic trade sales, the expected collusive and operational synergies that can be gained by synergetic buyers are lower in early-stage ventures than in later-stage ventures.

Overall, we expect that the difference in ex ante informational asymmetries between lateral and synergetic trade buyers is even higher in deals involving young portfolio companies. The limited synergetic gains of early-stage ventures dampens the willingness to pay of synergetic trade buyers and should have less of an effect on lateral trade buyers, as they still gain new strategic options through buying an early-stage venture. Overall, we therefore propose that the difference between the investment returns gained by venture capitalists through synergetic and lateral trade sales is particularly high for early-stage ventures:

Hypothesis 3.1: *The differences in returns to venture capitalists between synergetic and lateral trade sales are moderated by venture development stage, such that these differences are more pronounced if the portfolio company is in an early stage.*

Similarly, the development stage of the venture is likely to also have an impact on the return differences of horizontal and vertical trade sales as subgroups of synergetic trade sales. As explained above, we expect that venture capitalists are able to achieve higher investment returns with horizontal than with vertical trade sales, due to the higher potential synergy gains in horizontal trade sales. We expect that the differences in venture capital investment returns between vertical and horizontal trade sales diminish in earlier stages of venture development. In early-stage ventures with limited performance track records and high uncertainties of future success,

the expected ex post synergies achieved by trade buyers will be lower than in later-stage ventures. Due to the limited synergy potential, the difference in the value creation potential seen by horizontal and vertical trade buyers is likely to be smaller in transactions involving early-stage companies. Therefore, we hypothesize:

Hypothesis 3.2: *The differences in returns to venture capitalists between vertical and horizontal trade sales are moderated by venture development stage, such that these differences are more pronounced if the portfolio company is in an early stage.*

Experience of the venture capitalist

The level of experience of the venture capitalist is likely to be another factor behind the return differences between trade sales. Venture capitalists are active investors that select young, high-potential ventures, then work with them to increase firm value. Venture capitalists add value to their investments by closely monitoring the entrepreneur (Lerner 1995; Davila, Foster et al. 2003) and giving advice in strategic decisions (MacMillan, Kulow et al. 1989; Hellmann and Puri 2000; Bottazzi, Da Rin et al. 2008). In addition, venture capitalists provide the entrepreneur access to their network to recruit new managers, identify additional suppliers or customers, and raise further external capital (Hellmann and Puri 2002; Hsu 2004; Hochberg, Ljungqvist et al. 2007). With increasing experience, venture capitalists improve their value-adding capabilities, build up a larger network of contacts, and receive a higher quality deal flow (Gupta and Sapienza 1992; Powell, Koput et al. 2002). For outsiders, this experience can hence act as a signal for the quality of the portfolio company, thereby reducing information asymmetries (Gompers 1996). Accordingly, it is shown that IPO underpricing is lower when the IPO company is backed by a high-quality venture capitalist (Barry, Muscarella et al. 1990; Megginson and Weiss 1991; Gompers 1996; Nanda and Yun 1997). Similarly, we expect that in trade sales the involvement of an experienced venture capitalist indicates a higher likelihood of future success of the venture, hence driving return differences between trade sales.

Venture capitalist experience as a signal of quality for the portfolio company should be particularly relevant for exits involving buyers with high information asymmetries. As explained above, in lateral trade sales where trade buyers are not yet active in the same or similar lines of business, such information asymmetries are higher than in industry-related trade sales. Syner-

getic trade buyers are less dependent on quality signals from third parties such as venture capitalists, as they have profound industry knowledge that helps them in judging the future probability of success of the venture. Venture capitalists are hence likely to leverage their experience more in trade sales involving lateral rather than synergetic trade buyers, using their reputation as a kind of substitute for the absent information asymmetry advantage. Therefore, we expect that return differences between lateral and synergetic trade sales are less pronounced for deals involving an experienced venture capitalist:

Hypothesis 4.1: *The differences in returns to venture capitalists between synergetic and lateral trade sales are moderated by venture capitalist experience, such that these differences are less pronounced if venture capital experience is high.*

For both horizontal and vertical trade buyers, venture capitalist experience signals a higher probability that the venture will be successful in the long term, and that the expected synergy gains can be realized. Vertical trade buyers reduce their strategic flexibility by buying a venture that is active either in an earlier or later process step on the same value chain. It is likely that the quality signal of an experienced venture capitalist is particularly relevant in the context of vertical trade sales, as this reduces uncertainty that the product or service offered by the venture will reach an established market position. Therefore, we expect that for deals involving experienced venture capitalists, the return differences between horizontal and vertical trade sales will be lower than in other deals:

Hypothesis 4.2: *The differences in returns to venture capitalists between horizontal and vertical trade sales are moderated by venture capitalist experience, such that these differences are less pronounced if venture capitalist experience is high.*

Market environment for venture capital exits

Venture capital exit markets follow so-called boom and bust cycles (Lerner 2002a). Boom periods are characterized by liquid equity markets that facilitate venture capital exits via IPOs and by high supply and demand for venture capital (Jeng and Wells 2000; Gompers, Kovner et al. 2008). During upswing markets, venture capital investors are likely to want to increase their exposure to this asset class; in addition, entrepreneurs are motivated by successful exit stories to start their own businesses (Lerner 2002a). The period 1999 to 2000 was an extraordinary

boom period for venture capital, with a record number of IPOs, fundraising volumes, and investment volumes (Gompers and Lerner 2004). Such exceptional market conditions are likely to have an impact on trade sale exits, as the relevance of information asymmetries between buyer and seller as well as risk considerations of trade buyers change. We therefore examine whether, during the boom period of 1999 to 2000, the above hypothesized relationships between industry relatedness of trade sales and the investment returns achieved by venture capitalists are different than in other periods.

For lateral buyers, it may be particularly appealing to close an acquisition to enter a ‘hot’ market during boom periods. In contrast, synergetic buyers are already active in a similar industry and their information asymmetries regarding the potential target are lower. For a venture capitalist, it should hence be more difficult to take advantage of a boom period in negotiations with synergetic trade buyers, while in lateral trade sales the venture capitalist can use the positive market climate to persuade the less informed buyer to pay a higher price. We therefore expect that the return differences of lateral and synergetic trade sales to be more pronounced during boom periods:

Hypothesis 5.1: *The differences in returns to venture capitalists between synergetic and lateral trade sales are moderated by the market environment for venture capital exits, such that these differences are more pronounced in boom periods.*

In boom periods, it might be easier for venture capitalists to convince vertical trade buyers of the advantage in backward- or forward-integrating a portfolio company. Optimistic market sentiment is likely to help the venture capitalist to stress the future value potential of the venture. In a positive market environment, vertical buyers are likely to be less resistant to decreasing their strategic flexibility and might feel pressure to be an early mover toward adopting an innovation by integrating the portfolio company. This could lead to a decreased difference in the venture capital investment return potential of horizontal and vertical trade sales during upswings in the venture capital market:

Hypothesis 5.2: *The differences in returns to venture capitalists between horizontal and vertical trade sales are moderated by the market environment for venture capital exits, such that these differences are less pronounced in boom periods.*

5.3 Data and Variables

5.3.1 Sample Description

Our analysis is based on a proprietary data set from two leading European private equity funds-of-funds. As part of their role as asset managers, both funds assembled comprehensive deal-level databases from fund managers to optimize their internal asset allocation decisions.

Every time venture capital firms address potential investors, so-called limited partners such as funds-of-funds investors, to raise new funds, they are required to provide detailed information for investor due diligence efforts. Among other items, investors ask for comprehensive information on historical exited transactions. The result is that these databases contain detailed deal-level information on various characteristics of the portfolio companies in which the fund-seeking venture capital firms previously invested. It is important to note that these data sets are assembled during the due diligence process, i.e., before funds-of-funds’ asset allocation decisions. Consequently, we analyze not only transactions by venture capitalists in which these fund-of-funds finally invested, but also those in which they decided not to invest. This sampling method strongly reduces the issue of selective reporting by venture capitalists (Kaplan and Schoar 2005).

Although it is widely known that investments in venture capital funds generate a large proportion of underperforming transactions and write-offs, venture capitalists less actively report these exits in publicly accessible databases. Hence, empirical data solely relying on public information sources are not likely to accurately represent these transactions. In contrast, our sample displays a more realistic picture, partly reducing a frequently cited positive selection bias in comparable studies (Chaplinsky and Gupta-Mukherjee 2010). Nevertheless, a potential disadvantage of this sample would arise if the limited partners’ accessible pool of venture capitalists is not representative.

Panel A of Table 5-1 shows relevant key characteristics of venture capitalists included in our sample. Some 107 different venture capitalists are part of the sample, with a median vintage year of 1997, median age at the time of investment of 11 years, and median fund size of USD195 million. Our data set includes only independent venture capitalists and no government or corporate venture capitalists. In contrast to public databases, for each deal, we observe monthly

gross cash flows between the portfolio company and the venture capitalist. Additional information is added to the original databases via Thomson ONE Banker (TOB).⁴¹³

⁴¹³ TOB allows, among other things, access to Securities Data Company’s M&A Database, Worldscope, Venture Economics, and VentureXpert.

Table 5-1: Descriptive Sample Statistics

This table displays descriptive statistics on 2,355 venture capital-backed transactions exited between 1982 and 2008. If not indicated otherwise, information is retrieved from our proprietary data set. Panel A presents selective characteristics for the 107 different venture capital firms in our sample. Venture capital firm age at entry refers to the number of years the venture capitalist (not the fund) has existed before the transaction at hand. Accordingly, entry year is the year in which the first cash flow from the venture capital firm to the portfolio company occurs. Fund vintage year is the year in which the respective fund made its first investment. Fund size refers to the assets under management in millions of USD at entry. Panel B shows selective descriptive statistics on investment level for our full data set and our subsample of strategic trade sales only. Exit year is the year in which the last substantial cash flow from the portfolio company to the venture capital firm occurred. Holding period is the number of years a venture capital firm held a portfolio company, i.e., the time span between entry and exit year in years. Number of total investors counts the involved venture capital firms in the current and previous financing rounds at entry date. “Investment size” and “Divestment size” are the sum of all cash flows from the venture capitalist to and from the portfolio company in millions of USD.

Panel A: VC firm & fund characteristics					
Number of different VC firms	107				
Median age of VC firm at entry date (in years)	11.0				
Median fund vintage year	1997				
Median fund size (USD million)	195				
Panel B: Investment characteristics					
All exit types	Obs.	Min	Max	Average	Median
Entry year	2,355	1980	2005		
Exit year	2,355	1982	2008		
Holding period (in years)	2,355	0.3	21.8	4.4	3.9
Syndication size	2,283	1.0	36.0	7.3	6.0
Investment size at entry (USD million)	2,355	0.0	95.4	7.1	4.0
Divestment size at exit (USD million)	2,355	0.0	1,534.0	14.2	1.1
Trade sales exits only	Obs.	Min	Max	Average	Median
Entry year	716	1981	2005		
Exit year	716	1984	2008		
Holding period (in years)	716	0.3	21.8	4.0	3.5
Syndication size	701	1.0	32.0	6.5	6.0
Investment size at entry (USD million)	716	0.0	79.7	7.0	4.2
Divestment size at exit (USD million)	716	0.0	603.1	18.5	6.4

Since we focus exclusively on trade sale exits of venture capitalists, we do not consider unrealized transactions, investments not part of a typical venture capital investment stage (e.g., buyouts), nor any other exit channels, such as IPOs, sales to financial buyers,⁴¹⁴ buybacks, or write-offs. In addition, due to limited data representation, we exclude all investments in regions outside North America and Europe.

In line with GOMPERS ET AL. (2008), we do not consider follow-up financings, as the empirical results are expected to reveal the distinct characteristics of individual investment events. In this context, follow-up financings depict only duplicates of the respective initial investments. Multiple investments into the same portfolio company occur frequently in venture capital investing. In this way, investors guarantee sufficient funding until the successful exit of the portfolio company (Gompers 1995). For this reason, we ensure that no double entries occur from the two databases after their merger. Next, we delete all transactions with total committed capital below USD10,000 and above USD100 million. Observations that fall into these categories are not considered to convey significant information about exit decisions in the traditional business model of venture capitalists (Giot and Schwienbacher 2007). Finally, we drop all transactions with total holding periods below three months, as investment performance would be driven mainly by market conditions and not by fundamentals when venture capitalists have such a short time period to add value (Giot and Schwienbacher 2007; Hege, Palomino et al. 2009). This pre-filtering process leads to a final sample of 716 trade sales exited between 1982 and 2008. Panel B of Table 5-1 summarizes the relevant descriptive statistics at the transaction level for our full data set, as well as for our subsample of trade sales. Compared to data from the NVCA, we cover approximately 13% of the universe of successful venture capital-backed exits in the US between 1982 and 2008 (by number of deals).

5.3.2 Variable Descriptions

5.3.2.1 Dependent Variable

Our main focus is to identify return differences between lateral and synergetic as well as horizontal and vertical trade sales. Hence, our dependent variable is deal-level performance. We measure deal-level performance from the perspective of the venture capitalist using the internal rate of return (IRR) for each deal, gross of fees and carried interest. IRR is the most important

⁴¹⁴ We exclude all buyers with a Standard Industrial Classification (SIC) code of 6799, as this code represents financial institutions such as venture capitalists or private equity firms.

and most widely used performance measure among practitioners and scholars (e.g., Cochrane 2005; Kaplan and Schoar 2005; Phalippou and Gottschalg 2009). Based on the time value of money assumption, the IRR depicts an implied discount rate of cash inflows and outflows from portfolio companies that results in a net present value of zero. In general, all included investments follow a similar pattern. While negative cash flows are incurred at the beginning and throughout the investment period, positive cash flows are created at the point of exit. Hence, the problem of “non-normal” cash flows with time varying inflows and outflows does not affect the analysis.

All cash flows accruing between the venture capitalist and the portfolio company over the entire investment period are reported in our proprietary database. By directly using these cash flows, we can take account of any potential factor influencing cash flow to equity holders during the holding period (e.g., intermediate dividends). With this result, we can improve data reliability compared to similar studies, where commonly round-to-round valuations are used to approximate investment performance (Cochrane 2005).

While extreme positive outliers are inherent in the venture capital business, for the most successful 1% of transactions in our sample, we replace IRR with the highest IRR of the remaining 99% of transactions (i.e., we winsorize IRR at the 99th percentile), to avoid problems of biased coefficients and large standard errors. In Section 4.3, we extensively discuss robustness of results in terms of alternative performance measures.

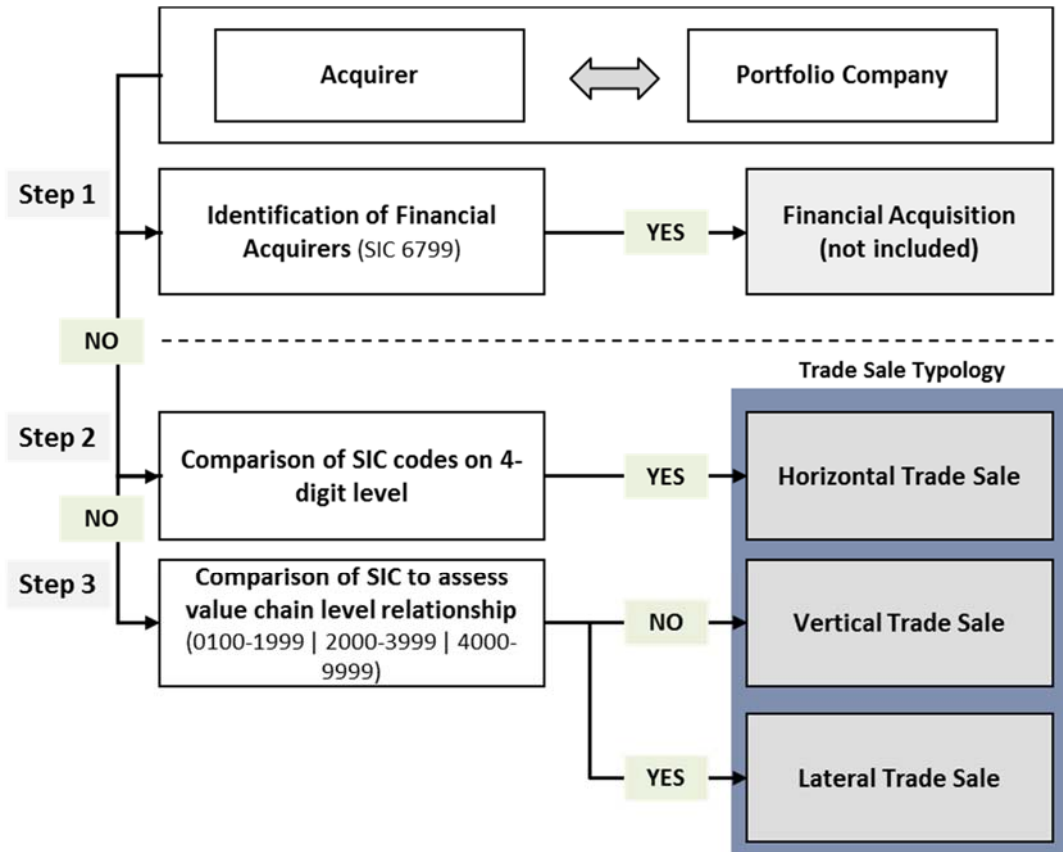
5.3.2.2 Independent Variables

We investigate the relationship between industry relatedness in trade sales and deal-level performance. Building on the results of M&A research, the Standard Industrial Classification (SIC)⁴¹⁵ codes serve as the fundamental basis to classify trade sales based on industry relatedness. Figure 5-2 outlines our classification procedure. The SIC coding for each of the portfolio companies and the trade buyer serves as our starting point. We differentiate the 716 trade sales into lateral and synergetic trade sales and further distinguish synergetic trade sales into horizontal and vertical trade sales.

⁴¹⁵ SIC codes form a hierarchical system that increases granularity of differentiation with each digit of its code.

Figure 5-2: Categorization Scheme to Identify Fundamental Strategic Rationales

In assessing the relationship between the acquirer and the portfolio company, this figure outlines the simplified scheme used to identify the strategic rationale behind the trade sale exit. Based on this relationship, we classify different types of trade sales for our empirical analysis. To distinguish between industries, we resort to Standard Industrial Classification (SIC) codes, a hierarchical system that increases granularity of differentiation with each digit of its code.



We begin with identification of horizontal trade sales. Despite a generally strong relatedness within SIC categories on the 2-digit and 3-digit level, we assume trade sales target horizontal integration only if the portfolio company and the acquirer share the same 4-digit SIC code (Capron 1999). This implies that these firms not only operate within the same industry, but that they also show a high degree of congruence with regard to their business activities; 247 (34%) of the 716 trade sales in our sample meet this criterion and are, therefore, considered horizontal trade sales.

To differentiate between vertical integration and diversification activities, we resort to the methodology of DAVIS AND DUHAIME (1992). These authors suggest splitting up the entire SIC code range in terms of a simplified value chain (raw materials: SIC 0100-1999, manufacturing: SIC 2000-3999, services: SIC 4000-9999). The result is that two businesses exhibit vertical integration if their primary SIC codes are located in different stages of the value chain. All other transactions are classified as lateral trade sales, with one exception: according to DAVIS AND DUHAIME (1992) vertical integration might also exist within the individual stages of the value chain, thus leaving the potential for false allocation of specific transactions.

To overcome this issue, we follow SHACKMAN (2007), and test for within-stage vertical integrations through introduction of SIC-based Fama/French-industries, and then test for relatedness on the two-digit SIC level (Fama and French 1997). In this way, we ensure that vertical trade sales are captured beyond application of the simplified value chain. Accordingly, for example, we consider an advertising agency (SIC 7311) to be vertically integrating if it acquires a software company (SIC 7372). Applying the outlined methodology to the remaining group of 469 trade sales (716 minus 247), we end up with 190 (27%) vertical trade sales, and 279 (39%) lateral trade sales.

In addition to the main effects of venture capital investment return differences between trade sales, we examine three moderating factors that influence these differences, either enhancing or reducing them: First, we use financing-stage categories of the portfolio company to analyze whether the development stage of the venture is a moderating factor for return differences among trade sale groups. We resort to commonly used financing-stage categories and compute a binary variable differentiating between ventures in early and late development stages. Second, we include the experience of the venture capitalist as another moderating factor and use venture capital–firm age at the time of the investment as proxy. Among others, KAPLAN AND SCHOAR

(2005) find evidence of strong performance persistence within the private equity industry. Historical success enables investment managers to raise subsequent funds. In this context, venture capital–firm age represents a proxy for advanced investment skills, which allow not only better access to the most promising projects, but also more efficient monitoring of portfolio companies throughout the investment period. We calculate venture capital–firm age at exit date in years by subtracting founding year of the venture capital–firm from the exit year of the respective transaction. We differentiate experienced from inexperienced venture capitalists via a dummy variable that takes the value 1 if the age of the invested venture capitalist is greater than the median age of all venture capital firms in our sample (at the time of the transaction) and zero if it is below. Third, we use a dummy variable that takes the value 1 for all transactions closed during the years 1999 and 2000. This extraordinary period represents a boom period in terms of number of IPOs, volume of fundraising, and number of venture capital investments (Lerner 2002a).

5.3.2.3 Control Variables

To capture differences in returns between trade sales in our multivariate analyses, we control for a number of other factors that previous studies have shown to influence the performance of venture capital investments.

As portfolio company–related control variables, we include industry affiliation⁴¹⁶ and geographic location, i.e., whether the portfolio company is located in North America or Europe. We utilize exit years to control for the cyclical nature of the venture capital business (Kaplan and Schoar 2005; Gompers, Kovner et al. 2008; Harris, Jenkinson et al. 2011). On the level of the venture capitalist, we control for the impact of venture capital syndication. The literature suggests that syndication should lead to improved investment screening by securing a second opinion in the due diligence process (Casamatta and Haritchabalet 2007). Syndication is represented by the total number of venture capital firms that invest in the portfolio company throughout the entire investment period. Finally, as our trade sale groups are based on acquirer characteristics, we also control for the size of the trade buyer by including the log value of its assets. In the case that our original data source provides no information on acquirer size at exit date, we impute this variable to preserve the observation for our multivariate analysis.

⁴¹⁶ To build on a meaningful number of transactions per industry, we follow a similar approach as Gompers et al. (2008), merging the allocated 49 Fama/French industries into six broad industry sectors, namely software, technology, services, healthcare, telecommunications, and other.

5.4 Empirical Results on Venture Capital Return Differences in Trade Sales

5.4.1 Descriptive Statistics and Univariate Results

Panel A of Table 5-2 reports deal-level investment performance for our full sample of 2,355 realized venture capital transactions. Panel A shows that the employed sample contains information on 555 IPOs, 716 trade sales, 71 financial and other acquisition exits (e.g., buybacks), and 1,013 write-offs. Compared to samples of similar studies (Ruhnka, Feldman et al. 1992; Moskowitz and Vissing-Jorgensen 2002; Cochrane 2005; Giot and Schwienbacher 2007), our distribution of exit types shows a higher proportion of write-offs. Panel A, moreover, reveals that throughout the entire sample period (exits between 1982 and 2008), venture capitalists earned an average IRR of 25.9% and a median return of -26%. The negative median IRR reflects the high number of transactions with negative returns, in particular, write-offs. Looking at aggregated performance by exit type, we find substantial return differences among major divestment routes. Overall, our sample seems to confirm the frequently discussed venture capital exit pecking order (Brau, Francis et al. 2003; Bienz and Leite 2008; Cumming and Johan 2008a). In terms of median returns, IPOs (36% IRR) seem to generate higher returns to venture capitalists than trade sales (19% IRR). Accordingly, our median IRR of 19% is comparable to median returns of trade sales in the range of 15% to 26% reported in previous studies (Gompers 1995; Bienz and Leite 2008; Cumming 2008). With median IPO IRRs between 58% and 64%, these studies tend to show higher performance for IPOs than our median of 36% suggests. One possible explanation is the fact that we base our performance calculation on actual cash flows. In contrast to IPO date valuation approaches, often the actual return for venture capitalists differs due to stock price development during the lockup period. However, the lower returns in our sample compared to other studies might, at least partially, again hint at reduced positive selection bias.

Table 5-2: Deal-Level Investment Performance

This table displays deal-level investment performance (IRRs) for our full sample of 2,355 venture capital-backed transactions exited between 1982 and 2008 (Panel A). IRR is calculated from monthly cash flows between venture capital firms and the corresponding portfolio company, gross of fees and carried interest. It is the discount rate that equates the present value of these cash flows to zero (reported in %). Panels B and C provide comparable data for our subsample of 716 strategic trade sale exits. For this purpose we break the group of 716 strategic acquisitions down into three additional detailed subgroups. We differentiate lateral, horizontal, and vertical trade sales on the basis of industry relatedness between portfolio company and acquirer. The latter two form the aggregated subgroup of synergetic trade sales. Panel C reports additional information for our subsample of trade sale exits by time period, industry, and corporate stage. Each transaction is assigned to one time period based on its exit year, i.e., the year in which the last substantial cash flow from portfolio company to venture capital firm takes place. The distribution of exit types across industries is defined on the basis of primary SIC codes (Fama and French, 1997). Information on typical venture capital-related financing stages is provided by Thomson ONE Banker. We test the statistical significance of differences among different types of trade sale exits with mean (two-sample t-test) and median (Fisher’s exact test) comparison tests (Panel B). *, **, and *** indicate p -values of 10%, 5%, and 1%, respectively.

Dependent variable: IRR	Obs.	Mean	25%	Median	75%	Max	Std. Dev.	t-test	Fisher's Exact
Panel A: Full sample									
All exit types	2,355	25.9%	-100.0%	-26.0%	34.0%	14558.0%	4.5608		
IPOs	555	116.0%	10.0%	36.0%	99.0%	9243.0%	4.4855		
Trade sales	716	119.3%	-12.5%	19.0%	66.0%	14558.0%	7.0248		
Financial & other sales	71	23.5%	-29.0%	13.0%	38.0%	623.0%	1.0125		
Write-offs	1,013	-89.3%	-100.0%	-100.0%	-93.0%	-1.0%	0.2132		
Panel B: Trade Sales by industry relatedness									
Lateral trade sales	279	100.6%	-7.0%	23.0%	83.0%	4012.0%	3.8428		
Synergetic trade sales	437	131.2%	-14.0%	17.0%	60.0%	14558.0%	8.4543		
Horizontal trade sales	247	190.0%	-10.0%	24.0%	66.0%	14558.0%	11.1126		
Vertical trade sales	190	54.7%	-15.0%	10.5%	55.0%	1701.0%	1.7634		
Lateral vs. synergetic								+	+
Horizontal vs. vertical								+**	+**
Panel C: Trade sales by time periods, industry sector and stage									
Industry sector of portfolio company:									
The 80's: 1982-1989	24	33.1%	-6.0%	23.5%	54.0%	239.0%	0.7441		
Early 90's: 1990-1995	68	46.3%	1.0%	23.5%	65.0%	531.0%	0.8838		
Pre-bubble: 1996-1998	77	85.2%	1.0%	25.0%	91.0%	1460.0%	2.0693		
Bubble: 1999-2000	148	421.8%	17.5%	89.5%	273.0%	14558.0%	14.6760		
Post-bubble: 2001-2002	97	18.8%	-52.0%	7.0%	40.0%	491.0%	0.9710		
Recent: 2003-2008	302	35.2%	-20.0%	7.0%	36.0%	3058.0%	2.1662		
By industry sector of portfolio company:									
Software	258	83.4%	-17.0%	16.0%	59.0%	4012.0%	3.1900		
Technology	93	334.7%	-6.0%	31.0%	178.0%	14558.0%	15.6741		
Services	93	60.5%	-15.0%	12.0%	42.0%	1431.0%	2.2448		
Healthcare	128	67.4%	-11.0%	22.0%	78.5%	2570.0%	2.4365		
Telecommunications	39	182.5%	15.0%	30.0%	66.0%	3058.0%	5.5881		
Other industries	105	108.3%	-13.0%	16.0%	49.0%	8456.0%	8.2708		
By stage of portfolio company:									
Seed/start-up	126	127.1%	-16.0%	15.0%	77.0%	4012.0%	4.3915		
Early stage	227	94.4%	-10.0%	19.0%	69.0%	3058.0%	3.0140		
Expansion	280	154.2%	-15.0%	18.5%	60.5%	14558.0%	10.4790		
Later stage	83	57.6%	7.0%	31.0%	68.0%	579.0%	1.1197		

Panel B reports aggregated returns for our different types of strategic trade sales. For the group of 279 lateral trade sales, we find a median return of 23.0% IRR. This compares to a median IRR of 17.0% for synergetic trade sales. For the two subgroups of synergetic trade sales, we find substantial performance differences. Hence, with a median IRR of 24.0%, horizontal trade sales yield substantially more than vertical trade sales, which have a median IRR of 10.5%. Similar to previous studies, we find large differences between mean and median returns, highlighting the presence of a typical venture capital-like return distribution, including some strong investment performances in the sample. Statistical tests for significance of differences among different types of trade sale (two-sample t-test for mean returns and Fisher’s exact test for median returns) show mixed results. We find a statistically significant difference at the 5% level among horizontal and vertical trade sales, whereas we find no significant result among our sample of lateral trades sales and our aggregated group of synergetic trade sales.

Panel C shows additional descriptive statistics for our group of trade sales for different periods in time, industry, and corporate stage of the portfolio company. Hence, investment returns peak during the distinctive bubble years of 1999 and 2000, followed by a sharp drop in returns from exits in the post dot-com era. Thus, substantially varying standard deviations provide evidence for a venture capital-typical, right-skewed data distribution. Interestingly, median returns are higher for later-stage transactions (31% IRR), whereas the expansion stage shows a performance pattern that is in particular driven by extreme outliers. Across our major industry sectors, we observe overall comparable return patterns.

5.4.2 Multivariate Results

To test our hypotheses, we run multivariate cross-sectional regressions including all control variables. The resulting models related to performance differences between synergetic and lateral trade sales are presented in Table 5-3, and those regarding horizontal and vertical (synergetic) trade sales are set forth in Table 5-4. As is evident from all models in Table 5-3, lateral trade sales generally show higher venture capital investment returns than synergetic trade sales. However, statistical significance is only moderate for the main effect in Model 1, providing some support for Hypothesis 1. In economic terms, Model 1 indicates that, on average, synergetic deals yield a 20-percentage-point lower IRR than lateral trade sales. While most models in Table 5-4 show that returns to venture capitalists are higher for horizontal trade sales than for vertical transactions, our data do not provide convincing evidence for Hypothesis 2.

Models 2 and 3 in Table 5-3 show regression results for our subsamples of early- and later-stage venture capital companies, respectively. The numbers show that there is a significant performance difference of about 45 IRR percentage points between lateral and synergetic trade sales for early-stage but not later-stage ventures. In addition, synergetic trade sales \times early-stage interactions in Models 4 and 11 are significant and negative. This supports Hypothesis 3.1 that higher returns for lateral trade sales are more pronounced for early-stage ventures. With about 39 IRR percentage points, this moderating effect is also relevant practically.

While Models 2 to 4 and Model 11 in Table 5-4 suggest a similar moderating effect for the venture development stage in the relationship between type of synergetic trade sale and performance, the vertical trade sales \times early-stage interactions are not significant and we therefore conclude that Hypothesis 3.2 is not supported.

Models 5 to 7 and Model 11 in Tables 5-3 and 5-4, respectively, provide evidence supporting our Hypotheses 4.1 and 4.2, stating that venture capitalist experience has a moderating effect on trade sale performance differences. While performance differences are both economically and statistically small if venture capital experience is high (Model 6 in Tables 5-3 and 5-4, respectively), the differences are substantial if venture capital experience is low (Model 5 in Tables 5-3 and 5-4, respectively). In addition, the synergetic trade sales \times high venture capital experience interactions (10% level) and the vertical trade sales \times high venture capital experience interactions (5% level) are statistically significant and positive. We interpret this as support for our Hypotheses 4.1 and 4.2. While this moderating effect is quite high for horizontal versus vertical trade sales and amounts to around 60 IRR percentage points, it amounts to only around 30 percentage points in the performance differences between lateral and synergetic trade sales.

Turning to Hypothesis 5.1 (see Table 5-3, Models 8 to 11), it is evident that the performance difference between lateral and synergetic trade sales is indeed more pronounced in boom periods of the market cycle. However, as the synergetic trade sales \times boom period interactions are not statistically significant, we do not find convincing support for Hypothesis 5.1.

In turn, Models 8 to 11 in Table 5-4 provide evidence for an economically strong moderating effect of venture capital market cycles in the performance differences between horizontal and vertical trade sales. In boom times, this discrepancy is even 90 IRR percentage points stronger than in other venture capital market cycles. This effect and the positive coefficient for the main effect in Model 8 suggest that in boom times, vertical trade sales yield even higher returns to

venture capital firms than horizontal trade sales. We conclude that Hypothesis 5.2 is supported by our data.

Essay 2 – “Industry Relatedness in Trade Sales and Venture Capital Investment Returns”

Table 5-3: Regression Analysis—Lateral versus Synergetic Trade Sales

This table displays ordinary least squares regression results with heteroskedasticity-consistent standard errors clustered by venture capital firm on the determinants of investment performance using a sample of 716 venture capital-backed acquisition exits between 1982 and 2008. IRR is calculated from monthly cash flows between venture capital firms and the corresponding portfolio company, gross of fees and carried interest. It is the discount rate that equates the present value of these cash flows to zero (reported in %). We winsorize IRR at the 99th percentile. Time-fixed effects are based on the respective exit year. All variables are described in Table 5-6. *, **, and *** indicate *p*-values of 10%, 5%, and 1%, respectively.

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Dependent variable: IRR	Main	Subsample	Subsample	Interaction	Subsample	Subsample	Interaction	Subsample	Subsample	Interaction	Interaction
	All	Later VC	Early VC	Stage	Less exp.	More exp.	Age	Non-boom	Boom	Market cycle	All
Lateral TS vs. synergetic TS	-0.203* (0.109)	0.013 (0.118)	-0.448*** (0.160)	-0.013 (0.118)	-0.334** (0.157)	-0.061 (0.147)	-0.339** (0.139)	-0.054 (0.091)	-0.823** (0.331)	-0.118 (0.100)	-0.082 (0.133)
Early stage	-0.183 (0.125)			0.374** (0.156)	0.141 (0.218)	0.098 (0.120)	0.140 (0.110)	0.032 (0.100)	0.662 (0.402)	0.146 (0.111)	0.404** (0.157)
Early stage x Lateral TS vs. synergetic TS				-0.392** (0.187)							-0.416** (0.184)
VC experience	0.136 (0.110)	-0.262** (0.111)	-0.156 (0.197)	-0.195 (0.123)			-0.347* (0.192)	-0.085 (0.085)	-0.405 (0.435)	-0.191 (0.124)	-0.398** (0.188)
VC experience x Lateral TS vs. synergetic TS							0.265 (0.171)				0.316* (0.170)
Boom market phase	0.752*** (0.268)	0.160 (0.428)	1.059*** (0.335)	0.766*** (0.261)	2.701*** (0.491)	1.189 (0.759)	0.796*** (0.276)			1.042*** (0.394)	1.101*** (0.397)
Boom market phase x Lateral TS vs. synergetic TS										-0.423 (0.395)	-0.413 (0.386)
Buyer size	0.134*** (0.026)	0.112*** (0.034)	0.142*** (0.031)	0.133*** (0.025)	0.145*** (0.050)	0.146*** (0.027)	0.135*** (0.026)	0.105*** (0.023)	0.223** (0.107)	0.135*** (0.026)	0.134*** (0.024)
Europe	0.461 (0.289)	0.339** (0.157)	0.854 (0.512)	0.454 (0.285)	1.106*** (0.347)	-0.186 (0.198)	0.461 (0.289)	0.251 (0.179)	1.231* (0.721)	0.453 (0.288)	0.445 (0.284)
Software	0.612* (0.317)	0.599** (0.299)	0.734 (0.464)	0.636** (0.316)	0.221 (0.336)	1.029** (0.497)	0.612* (0.318)	0.611** (0.239)	0.262 (0.864)	0.616* (0.314)	0.641** (0.315)
Services	-0.419** (0.178)	-0.257 (0.157)	-0.676** (0.280)	-0.426** (0.179)	-0.621* (0.340)	-0.180 (0.275)	-0.426** (0.176)	-0.241** (0.106)	-1.271* (0.731)	-0.432** (0.174)	-0.449** (0.172)
Healthcare	-0.063 (0.143)	0.185 (0.168)	-0.314* (0.172)	-0.057 (0.146)	-0.105 (0.226)	0.088 (0.176)	-0.062 (0.143)	0.324*** (0.105)	-1.622** (0.680)	-0.057 (0.142)	-0.049 (0.147)
Telecommunication	-0.017 (0.399)	-0.274 (0.270)	0.062 (0.934)	0.006 (0.403)	-0.322 (0.641)	0.287 (0.546)	-0.012 (0.400)	0.444 (0.381)	-1.719 (1.799)	0.014 (0.406)	0.043 (0.412)
Other industries	-0.599*** (0.157)	-0.492*** (0.186)	-0.651** (0.157)	-0.589*** (0.244)	-0.359 (0.254)	-0.627** (0.158)	-0.608*** (0.158)	-0.140 (0.142)	-2.210*** (0.481)	-0.602*** (0.153)	-0.602*** (0.155)
Syndication	-0.034** (0.013)	-0.015 (0.016)	-0.053*** (0.017)	-0.036*** (0.013)	-0.011 (0.017)	-0.064*** (0.015)	-0.035** (0.013)	-0.040*** (0.011)	0.006 (0.044)	-0.034** (0.013)	-0.036*** (0.013)
Year-fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Constant	-0.237 (0.286)	-0.253 (0.550)	0.199 (0.438)	-0.339 (0.281)	-0.474 (0.381)	-0.292 (0.581)	-0.187 (0.281)	-0.147 (0.281)	1.740** (0.836)	-0.292 (0.281)	-0.339 (0.273)
Observations	701	356	345	701	347	354	701	555	146	701	701
R-squared	0.279	0.313	0.312	0.282	0.343	0.322	0.280	0.162	0.246	0.281	0.286

Robust standard errors in parentheses

*** *p*<0.01, ** *p*<0.05, * *p*<0.1

Essay 2 – “Industry Relatedness in Trade Sales and Venture Capital Investment Returns”

Table 5-4: Regression Analysis—Horizontal versus Lateral Trade Sales

This table displays ordinary least squares regression results with heteroskedasticity-consistent standard errors clustered by venture capital firm on the determinants of investment performance using a sample of 429 venture capital-backed synergetic acquisition exits between 1982 and 2008. IRR is calculated from monthly cash flows between venture capital firms and the corresponding portfolio company gross of fees and carried interest. It is the discount rate that equates the present value of these cash flows to zero (reported in %). We winsorize IRR at the 99th percentile. Time-fixed effects are based on the respective exit year. All variables are described in Table 5-6. *, **, and *** indicate *p*-values of 10%, 5%, and 1%, respectively.

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Dependent variable:	Main	Subsample	Subsample	Interaction	Subsample	Subsample	Interaction	Subsample	Subsample	Interaction	Interaction
IRR	All	Later VC	Early VC	Stage	Less exp.	More exp.	Age	Non-boom	Boom	Market cycle	All
Horizontal TS vs. vertical TS	-0.069 (0.106)	-0.039 (0.146)	-0.101 (0.208)	0.018 (0.167)	-0.360** (0.153)	0.062 (0.171)	-0.391*** (0.143)	-0.256*** (0.071)	0.502 (0.494)	-0.259*** (0.097)	-0.470*** (0.151)
Early stage	0.010 (0.162)			0.084 (0.290)	0.258 (0.282)	-0.101 (0.181)	0.044 (0.169)	-0.006 (0.151)	0.321 (0.527)	-0.005 (0.162)	0.144 (0.291)
Early stage x Horizontal TS vs. vertical TS				-0.170 (0.321)							-0.263 (0.311)
VC experience	-0.054 (0.134)	-0.021 (0.136)	-0.163 (0.252)	-0.061 (0.140)			-0.311 (0.198)	-0.075 (0.105)	-0.114 (0.508)	-0.078 (0.128)	-0.357* (0.209)
VC experience x Horizontal TS vs. vertical TS							0.597** (0.250)				0.619** (0.257)
Boom market phase	0.651 (0.439)	1.780* (0.954)	1.823*** (0.613)	0.667 (0.412)	2.138*** (0.516)	1.316* (0.714)	0.594 (0.410)			0.151 (0.435)	0.083 (0.412)
Boom market phase x Horizontal TS vs. vertical TS										0.870* (0.461)	0.928** (0.446)
Buyer size	0.125*** (0.041)	0.140*** (0.047)	0.085 (0.069)	0.126*** (0.040)	0.149** (0.070)	0.126*** (0.041)	0.123*** (0.041)	0.066* (0.038)	0.290** (0.130)	0.114*** (0.039)	0.113*** (0.038)
Europe	0.469 (0.286)	0.238 (0.196)	0.832 (0.577)	0.464 (0.285)	1.244*** (0.352)	-0.281 (0.200)	0.505* (0.300)	0.193 (0.231)	1.295* (0.687)	0.478* (0.283)	0.508* (0.296)
Software	0.460 (0.325)	0.010 (0.358)	0.702 (0.595)	0.456 (0.324)	-0.436 (0.317)	1.422*** (0.452)	0.493 (0.320)	0.514* (0.291)	-0.196 (0.868)	0.435 (0.310)	0.463 (0.302)
Services	-0.422** (0.160)	-0.271 (0.198)	-0.553** (0.259)	-0.435** (0.168)	-0.771** (0.309)	0.090 (0.310)	-0.432*** (0.162)	-0.164 (0.145)	-1.047* (0.617)	-0.410** (0.157)	-0.440*** (0.165)
Healthcare	-0.312 (0.200)	-0.007 (0.284)	-0.663** (0.257)	-0.315 (0.203)	-0.649 (0.406)	0.048 (0.204)	-0.304 (0.195)	-0.007 (0.144)	-1.440 (0.859)	-0.323 (0.208)	-0.320 (0.208)
Telecommunication	0.167 (0.650)	-0.455 (0.443)	0.675 (1.351)	0.166 (0.648)	-0.577 (0.889)	0.813 (0.755)	0.110 (0.627)	0.823 (0.691)	-1.737 (1.831)	0.165 (0.637)	0.104 (0.612)
Other industries	-0.467* (0.241)	-0.219 (0.312)	-0.908*** (0.286)	-0.463* (0.240)	-0.370 (0.378)	-0.501** (0.240)	-0.489* (0.245)	-0.086 (0.183)	-1.884* (1.031)	-0.479* (0.248)	-0.495* (0.252)
Syndication	-0.046** (0.019)	-0.026 (0.017)	-0.052* (0.030)	-0.046** (0.019)	-0.009 (0.022)	-0.087*** (0.023)	-0.046** (0.019)	-0.052*** (0.016)	-0.026 (0.057)	-0.050*** (0.019)	-0.050** (0.019)
Year-fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Constant	-0.110 (0.481)	-0.106 (0.971)	-0.008 (0.812)	-0.154 (0.455)	-0.345 (0.574)	0.066 (0.650)	0.032 (0.483)	0.443 (0.413)	0.536 (0.937)	0.178 (0.478)	0.277 (0.459)
Observations	429	214	215	429	207	222	429	331	98	429	429
R-squared	0.263	0.353	0.287	0.263	0.365	0.371	0.270	0.178	0.212	0.273	0.283

Robust standard errors in parentheses

*** *p*<0.01, ** *p*<0.05, * *p*<0.1

5.4.3 Endogeneity Issues and Robustness Checks

One of the most important challenges in studying investment performance in conjunction with type of exit and their fundamental drivers is accounting for potential endogeneity issues (Hege, Palomino et al. 2009). In our analysis, the critical question is whether the observed deal-level investment returns are caused by differences in the quality of the respective portfolio company rather than by the outlined value drivers of certain trade sales. Consequently, it could be argued that significant results such as the superior investment performance of lateral trade sales are in fact determined by unobservable characteristics that influence both the type of trade sale and the investment outcome. Similar considerations regarding endogeneity can be found in related studies (Cumming 2008; Brau, Sutton et al. 2010).

An important challenge in addressing such considerations in the context of venture capital research is, however, to deal with data limitations regarding the quality of the included portfolio companies. Given the private nature as well as the young age of these companies, hardly any measurable data are available that could represent a reliable proxy for firm quality (Brau, Sutton et al. 2010). In addition, in the context of venture capital investing, frequently used financial indicators such as historical revenue and revenue growth patterns or even profitability margins carry limited explanatory power. This argument is supported by the fact that at times of exit valuation events in particular, future prospects play a more decisive role in determining relevant price ranges. Moreover, along the lines of our argument, it is above all the decision of the trade buyer as to how much to bid for a portfolio company up for sale. In this way, we argue that once a portfolio company reaches the point of being “exitable,”⁴¹⁷ specific indicators for firm quality are less relevant for return premia than are unique considerations of the acquirer. A drastic example for this argument would be a company whose value is driven primarily by unique assets such as technical patents, or access to a large customer base or unique personnel, but which is not yet able to implement a business model that generates actual returns or even positive profit. To reasonably account for firm quality in these cases, one would need to define traceable performance indicators for each portfolio company individually.

⁴¹⁷ This term is newly introduced and comparable to the frequently used word “bankable” representing projects showing characteristics that make them acceptable to institutional lenders for financing purposes. Accordingly, we define a portfolio company as “exitable” if it qualifies for a successful exit route, such as IPO or trade sale.

To account, nevertheless, for potential differences in firm quality, we exploit several control variables, such as stage, venture capitalist age, and venture capital syndication in our regression model. Accounting for these factors should allow us to substantially reduce endogeneity problems with regard to fundamental firm quality considerations. Nevertheless, other factors might explain the relationship between exit type and investment outcome. For example, CUMMING (2008) reports the impact of different control rights as part of venture capital contracts on the decision to pursue a specific exit strategy. It remains unanswered whether the arrangement of specific investment terms could have an impact on exit prices as well.

A related issue is the non-random decision to exit. CUMMING AND WALZ (2010) find for their sample of early- and late-stage ventures that unrealized returns, i.e., reported company values of enterprises that are not yet exited but still in the venture capitalist’s portfolio, are lower than realized returns. To account for this potential effect, we follow their procedure and run a two-step, Heckman-like sample selection correction on realized and unrealized exits. In the first step, we model the probability of an exit (a realized transaction) as a function of the holding period and conditions in the venture capital exit market at the time of the reported company value. The longer a company is in the portfolio, i.e., the longer the holding period, the higher the likelihood of being exited (Cumming and Walz 2010). We define the holding period as the number of months from the beginning of an investment until its exit. Similarly, the probability of exiting a company in the portfolio should be higher if the exit market is favorable, i.e. there is a strong interest in acquiring venture capital-backed companies. As proxy for ‘hot’ venture capital markets, i.e., times in which investors are particularly eager to allocate liquidity into promising new ventures, we use the intensity of yearly IPO activity for the transaction year as reported by NVCA. In the second step, we use the same specification as in the most comprehensive regressions (Model 11 in Tables 5-3 and 5-4, respectively) to model differences in returns.

In Models 3, 4, 7, and 8 in Table 5-5, lambda coefficients are not statistically significant and economically small, indicating that in our sample, unrealized returns are not statistically different from realized trade sale returns. In addition, the coefficients and statistical significance levels of interest remain basically the same as in our ordinary least squares regressions. Therefore, we conclude that our results are robust to these effects.

Table 5-5: Robustness Tests

Models 1, 2, 5, and 6 of this table display ordinary least squares regression results with heteroskedasticity-consistent standard errors clustered by venture capital firm using Cash multiple as an alternative measure of venture capital firm returns. Cash multiple is obtained by dividing cash inflows to the venture capital firm by its outflows. Models 3, 4, 7, and 8 present results obtained from a Heckman-like two-step procedure. In a first stage, we model the decision to fully realize an investment (sell all the shares through a trade sale). In the second stage, we model performance measured by winsorized IRR, accounting for the selection effect. Time-fixed effects are based on the respective exit year. All variables are described in Table 5-6. *, **, and *** indicate *p*-values of 10%, 5%, and 1%, respectively.

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Trade Sale (TS) dummy:	Lateral TS vs. synergetic TS				Horizontal TS vs. vertical TS			
Regression type:	OLS		Heckman		OLS		Heckman	
Dependent variable:	Cash multiple		1st stage: Full exit	2nd stage: IRR	Cash multiple		1st stage: Full exit	2nd stage: IRR
	Main All	Interaction All	Interaction All		Main All	Interaction All	Interaction All	
Trade Sale (TS) dummy	-0.428** (0.208)	0.129 (0.400)	0	-0.081 (0.197)	-0.332 (0.362)	-1.324 (0.798)	13.254 (0.000)	-0.470* (0.266)
Early stage	0.360 (0.240)	1.178*** (0.336)	0.162 (0.134)	0.403** (0.178)	-0.087 (0.323)	-0.240 (0.443)	0.133 (0.154)	0.144 (0.191)
Early stage x Trade Sale dummy		-1.331*** (0.370)		-0.415* (0.227)		0.334 (0.675)	9.492 (0.000)	-0.263 (0.285)
VC experience	-0.309 (0.341)	-0.512 (0.431)	0.201 (0.139)	-0.398** (0.183)	-0.158 (0.439)	-0.456 (0.731)	0.305* (0.161)	-0.357* (0.194)
VC experience x Trade Sale dummy		0.257 (0.480)		0.314 (0.227)		0.569 (0.906)	5.774 (0.000)	0.619** (0.286)
Boom market phase	1.020 (0.029)	1.261 (1.284)		2.368*** (0.403)	1.736** (0.863)	0.293 (1.239)		1.322** (0.539)
Boom market phase x Trade Sale dummy		-0.223 (0.965)		-0.411 (0.285)		2.360* (1.358)		0.927*** (0.346)
Buyer size	0.392*** (0.082)	0.388*** (0.078)	0.975*** (0.082)	0.139*** (0.032)	0.372*** (0.106)	0.340*** (0.116)	1.039*** (0.098)	0.116*** (0.044)
Europe	0.419 (0.566)	0.389 (0.547)	12.865 (0.000)	0.455*** (0.161)	0.060 (0.459)	0.130 (0.472)	13.254 (0.000)	0.515** (0.208)
Software	1.090 (0.733)	1.175 (0.734)	10.755 (0.000)	0.661*** (0.192)	1.335* (0.731)	1.306* (0.691)	9.492 (0.000)	0.472** (0.237)
Services	-0.691 (0.552)	-0.731 (0.545)	3.061*** (0.496)	-0.434** (0.183)	-0.506 (0.571)	-0.456 (0.561)	2.085*** (0.529)	-0.432* (0.239)
Healthcare	-0.162 (0.430)	-0.137 (0.455)	3.091*** (0.445)	-0.031 (0.171)	-0.943** (0.470)	-0.960** (0.463)	2.564*** (0.479)	-0.310 (0.223)
Telecommunication	-0.374 (0.784)	-0.274 (0.797)	6.963 (0.000)	0.052 (0.266)	-0.460 (1.103)	-0.518 (1.119)	5.774 (0.000)	0.106 (0.345)
Other industries	-1.066** (0.471)	-1.042** (0.466)	11.137 (0.000)	-0.587*** (0.183)	-0.643 (0.714)	-0.705 (0.745)	8.134 (0.000)	-0.489** (0.248)
Syndication	-0.105*** (0.029)	-0.110*** (0.029)	-0.028* (0.016)	-0.036*** (0.013)	-0.133*** (0.049)	-0.142*** (0.052)	-0.037** (0.019)	-0.050*** (0.017)
Year-fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
Log holding period			0.391*** (0.111)				0.418*** (0.129)	
VC activity			-0.003*** (0.001)				-0.003*** (0.001)	
Lamda				0.049 (0.140)				0.023 (0.163)
Constant	1.363 (0.886)	1.036 (0.924)	-9.097*** (0.727)	-0.404 (0.470)	0.840 (0.944)	1.844 (1.166)	-9.936*** (0.884)	0.236 (0.686)
Observations	701	701	1,947	0	1,947	429	429	1,675
R-squared	0.227	0.232				0.246	0.259	

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Further, PHALIPPOU (2010) shows that the implied reinvestment assumption of the IRR methodology may be a major pitfall with respect to venture capital investments. Therefore, we resort to cash multiples as an alternative performance measure commonly used in the venture capital industry (Harris, Jenkinson et al. 2011; Phalippou 2011). We obtain deal-level cash multiples by dividing cash inflows to the venture capital firm by its outflows. Cash multiples circumvent the IRR pitfall by capturing investment performance without regard to the underlying timeframe. While statistical significance is reduced when performance is measured by cash multiples due to larger standard errors, economic relationships and significances remain largely unchanged.

5.5 Discussion

5.5.1 General Discussion

This study examines the impact of industry relatedness in trade sales on venture capital investment returns. Two distinct factors define the importance of industry relatedness in our model: First, ex ante information asymmetry between the trade buyer and the venture capitalist varies contingent on the similarity of portfolio company’s and acquirer’s industry. Second, the expected ex post value created for the buyer by integrating the portfolio company differs depending on industry relatedness. Beyond examining these main effects, we go further and test the moderating impact of the development stage of the venture, the experience of the venture capitalist as intermediary and the general market environment for venture capital exits. This multilevel research design allows us not only to identify return differences of trade sales, but also to examine circumstances under which these return differences are particularly high or low.

Building on this model, we find confirmatory evidence that venture capitalists achieve higher investment returns from lateral trade sales compared to synergetic trade sales (Hypothesis 1). Provocatively, one could argue that venture capitalists harvest best from less informed buyers. The corporate development stage of the sold portfolio company seems to underpin this finding (Hypothesis 3.1). Hence, elevated results for early-stage companies emphasize the relevance of information asymmetries on the level of the trade buyer for investment returns of the venture capitalist. This is potentially even more pronounced in times of “hot” markets, when management of (in particular) unrelated companies is called on (sometimes pushed) to follow the latest industry trends to gain ground in growing into new industries by buying instead of building

firms (Hypothesis 5.2). In this way, we also link venture capital return analysis to general management investment considerations (Scharfstein and Stein 1990).

In line with the literature focusing on analysis of public exits, i.e., IPOs, we find further confirmatory evidence for the importance of experience in the venture capital industry (Barry, Muscarella et al. 1990; Megginson and Weiss 1991; Gompers 1996; Nanda and Yun 1997). If the venture capitalist is experienced, returns from synergetic trade sales are no longer lower than those from lateral trade sales (Hypothesis 4.1). We interpret this finding as pertaining to a skill obtained by venture capitalists over time and across transactions that allows them to overcome the missing high information symmetry advantage when exiting synergetic versus lateral trade sales. Underlying mechanisms could include a superior ability to identify synergetic acquirers willing to pay a similar price for a given company as a lateral acquirer; such ability is gained through, e.g., better networks. Possibly, experienced venture capitalists also learn how to ‘spin’ a sales story and improve their bargaining position.

In addition, we show that within the subgroup of synergetic trade sales, venture capitalists realize higher investment returns with horizontal than with vertical synergetic exits. Our results suggest that venture capitalists are able to marshal distinct synergies, such as collusive and operational synergies; horizontal trade buyers can expect this in pursuit of negotiating higher exit prices (Hypothesis 2). However, just as in the discussion above of lateral versus synergetic trade sales, experienced venture capitalists seem to be able to use their involvement as a quality signal for the future success of the venture leading to comparable prices achieved in both horizontal and vertical trade sales (Hypothesis 4.2). Finally, the moderating effect of the general investment environment supports our previous findings; the lower investment returns achieved with vertical trade sales are significantly increased during bubble periods (Hypothesis 5.2).

With these findings, our study contributes to the literature in two main ways: First, by documenting an association between industry relatedness in trade sales and venture capital investment returns, we complement prior studies, which thus far have treated trade sales as a homogeneous group. We explicitly take account of the heterogeneous return potential of trade sales and shed light on drivers of return differences at the deal-level. In contrast to most previous studies, our data include individual deal cash flows, allowing us to calculate deal-level investment returns and to link them to characteristics of the transaction. We theorize and empirically assess how different levels of industry relatedness mirrored in lateral or synergetic trade sales and horizontal or vertical trade sales are associated with venture capital investment returns. Second,

we follow a multilevel approach and analyze moderating influences that can further explain venture capital investment return differences between trade sales with differing levels of industry relatedness. We analyze the role of the development stage of the venture, the experience of the venture capitalist as intermediary, and the general market environment for venture capital exits.

5.5.2 Implications for Practice

Several practical implications for venture capitalists can be drawn from our study. In times of limited access to public markets, it becomes more important to understand specific drivers of investment performance of trade sales as the dominant exit route. Prior research has shown that venture capitalists often already plan for a specific exit route at the time of entry (Cumming and Johan, 2008b).

Our findings inform venture capitalists on the return potential of different exit routes. For exits of early-stage ventures, our results suggest that they should aim to sell to a lateral trade buyer; this in turn has implications as to how to position the venture. We believe that a better understanding of performance drivers in trade sales is imperative for venture capital as an asset class. History tells us that the opportunity to complete IPOs evolves in cycles and is feasible for only a small fraction of venture capital-backed companies. In contrast, trade sales represent a broader and less volatile exit channel. Hence, for venture capitalists, it is relevant to know which potential trade buyer offers the most promising investment returns. Our findings suggest that this particularly holds outside of boom-market cycles, when differences are more pronounced.

Accordingly, our results provide clear guidance to carefully monitor general investor sentiment. Disruptive waves of new technology that suggest fundamental changes to specific industries frequently open up opportunities for venture capitalists to capitalize on increasing interest by companies to engage in strategic acquisitions.

5.5.3 Limitations and Future Research

While we complement existing research on venture capital exits, we see potential for future research efforts to gain additional insight on trade sales as a heterogeneous group of exit strategies. First, it would certainly be interesting to better understand the decision of the venture capitalist to pursue a particular trade sale: When do they identify potential trade buyers for their

portfolio companies? How do they position a venture in order to make them attractive for a particular buyer? What are potential conflicts between the venture capitalist and the entrepreneur regarding the selection of a trade buyer and how can they be mitigated? Understanding the contextual factors that drive the decision on trade sales would assist us in improving our understanding of this increasingly relevant exit route for venture capitalists and provide guidance not only for venture capitalists, but also for entrepreneurs and investors into venture capital funds.

5.6 Conclusion

In conclusion, this study offers insights into the returns that venture capital firms achieve when selling portfolio companies to strategic acquirers, contingent on the industry relatedness of portfolio company and acquirer. Finding a lateral acquirer not yet active in the portfolio company’s field of business, yields higher returns than dealing with synergetic acquirers from similar industries and fields of business. Within the group of synergetic trade sales, horizontal acquirers, operating in the same process step of the value chain, pay higher prices for a given company than vertical acquirers from different process steps. Further, at the portfolio company-level, we find that strong information asymmetries, stemming from uncertainty about firm quality, in early-stage portfolio companies amplify the return differences between lateral and synergetic trade sales. At the venture capital firm-level, our results suggest that experienced venture capital firms are able to achieve comparable results, irrespective of industry relatedness of the acquirer. Finally, venture capital market-level analysis shows that return differences are contingent on the market situation: while during normal and bust market cycles horizontal trade sales yield higher returns to venture capitalist than vertical ones, this difference not only disappears in boom times, it actually inverts such that the latter deal type realizes higher prices for a given company. We hope that our findings encourage further research efforts that target the trade sale exit route, which has become increasingly important over the last several years.

Table 5-6: Appendix – Definition of Dependent, Independent, and Control Variables

<u>Dependent variables</u>	
IRR	IRR is calculated from monthly cash flows between VC firms and the corresponding portfolio company gross of fees and carried interest. It is the discount rate that equates the present value of these cash flows to zero (reported in percent)
Cash multiple	Cash multiple for each transaction is calculated by dividing the total cash inflows from the perspective of a VC firm by the total cash outflows
<u>Independent variables</u>	
Trade sales classifications	
Lateral TS vs. synergetic TS	A dummy variable which is set to equal to 1 if the venture was sold by means of a synergetic trade sale, 0 if the venture was sold by means of a lateral trade sale
Horizontal TS vs. vertical TS	A dummy variable which is set to equal to 1 if the venture was sold by means of a vertical trade sale, 0 if the venture was sold by means of a horizontal trade sale
<u>Moderating variables</u>	
Early stage	A dummy variable which is set to equal to 1 if the venture was at the seed/start-up or early stage, 0 otherwise
VC experience	A dummy variable which is set to equal to 1 if the age of the invested VC is greater than the median age of all VCs in our sample; the age of the VC is defined as the period of time between the founding date of the VC and the date of the initial investment in the portfolio company
Boom market phase	A dummy variable which is set to equal to 1 if the exit took place in 1999 or 2000, 0 otherwise
<u>Control variables</u>	
Transaction related	
Buyer size	Natural logarithm of total assets of the acquirer for the last full financial year prior respective investment; in the case that our original data source provides no information on acquirer size, we impute this variable to preserve the observation for our multivariate analysis.
Europe	A dummy variable which is set to equal 1 if the venture is located in Europe, 0 otherwise
Software	A dummy variable which is set to equal to 1 if the venture is in the software industry, 0 otherwise
Technology	A dummy variable which is set to equal to 1 if the venture is in the technology industry, 0 otherwise; technology embraces the computer, the semiconductor or electronic equipment industry
Services	A dummy variable which is set to equal to 1 if the venture is in the service industry, 0 otherwise; services embrace financials, business and other services
Healthcare	A dummy variable which is set to equal to 1 if the venture is in the healthcare industry, 0 otherwise
Telecommunication	A dummy variable which is set to equal to 1 if the venture is in the telecommunication industry, 0 otherwise
Other industries	A dummy variable which is set to equal to 1 if the venture is in any other industry, 0 otherwise
Syndication	The aggregated number of total investors that invested in the portfolio company until the exit of the company
Log holding period	Natural logarithm of number of years a venture capitalist held the portfolio company, i.e. the time span between entry and exit date in years
VC activity	The number of US venture capital backed IPOs in the exit year of the respective investment

6 Conclusion

6.1 Summary of Results

According to its three-part set-up, the thesis pursues three primary research objectives. The combination of these research objectives provides a comprehensive overview that allows understanding VC performance and its fundamental drivers.

Objective #1: Literature overview and assessment of VC investment success factors

Objective #2: Assessment of the interdependence of market volatility and VC investment success

Objective #3: Assessment of VC performance potential from acquisition exits

Thereby, objective #1 is designed to provide a holistic, literature-based summary of the current status-quo of VC performance research in particular at the individual deal-level. By means of a suitable framework the magnitude of identified success factors are reasonable structured, outlined and discussed. Objective #2 and #3 are primarily pursued by own empirical research facilitated by the access to proprietary industry data. Thereto, it has been noted that the focus of the analysis is motivated by the assessment of leading research: A potential mismatch of supply and demand on the global VC markets paired with continuing difficulties to utilize the public market to exit portfolio companies represent dominant challenges for venture capitalists today.⁴¹⁸ Accordingly, each of the two presented research papers (chapter 4 and 5) is explicitly dedicated to one of these challenges.

The thesis starts with the diligent introduction of VC as an asset class. For this purpose, key VC characteristics are introduced (*chapter 2*). First of all, characteristics of the two primary subjects (i.e. the venture capitalist on the one side and the portfolio company on the other side) are profoundly presented (*chapter 2.1*). This way, the fundamental task of a venture capitalist as financial intermediary is explained. Hence, typical investors in VC, different type of VC firms as well as the commonly utilized organizational structure of VC funds are presented. Subsequently, the focus turns towards common characteristics of typical VC target companies.

⁴¹⁸ Cf. Kaplan and Lerner (2010); Lerner (2011); Mendoza and Vermeulen (2011); Cumming and Johan (2012).

These companies are not only characterized by a high demand for financing but as well for non-capital resources. Other factors that influence the general suitability of VC financing for these firms presented. To this end, in particular the concept of corporate development stages and typical target industries are discussed.

A detailed outline of the typical VC investment process is presented thereafter (*chapter 2.2*). The understanding for the sequential nature of this process is a necessity for the subsequent analysis. Only the knowledge of relevant activities allows understanding on how different performance drivers work. For that purpose, the five most important activities that constitute the day-to-day business of a venture capitalist are introduced: investment origination, selection, structuring, development and the exit. Thereby, the presentation focuses on the relevant tasks that characterize each of these activities. As a result, the mechanisms utilized by venture capitalists to increase the value of his portfolio company are introduced. Moreover, the most relevant selection and investment criteria are presented. An overview of relevant VC exits and their fundamental characteristics closes this section. In summary, this chapter provides the relevant terminology and theoretical fundament for the following analysis.

Whenever the performance of an asset class is at the center of attention, first of all the respective meaning of performance needs to be clearly discussed (*chapter 3.1*). Hence, the introduction to relevant performance measures and the affiliated discussion of their general applicability in the context of VC represent the first part to achieve research objective #1. Accordingly, the IRR as well as cash multiples as the most prominent performance measures in VC are presented. However, as these measures have more recently been criticized for specific pitfalls, newly introduced measures which represent interesting alternatives to commonly applied measures are presented as well. For this purpose, the concepts of the MIRR and PME are brought forward as they address some of the mentioned limitations. It is noted that the PME is in particular suitable if VC returns are to be benchmarked against the public market or alternative asset classes.

For the discussion of performance drivers, the perspective of the analysis is of particular relevance. Thus, the examination of success factors depends on whether the focus is on returns from single VC transactions, from entire VC funds or even from the perspective of fund investors like fund-of-funds. Accordingly, the impact of specific portfolio company characteristics on individual transaction success is most relevant with regard to the applied investment strategy. Suchlike information helps venture capitalists to refocus their investment focus and make

adjustments to their general investment strategies. In contrast, VC investors are typically less interested in suchlike details, but more on venture capitalist related drivers behind fund performance. The matter of perspective is thereby closely linked to another important concept of VC performance which is subsequently introduced: gross versus net returns. Nevertheless, independent from the perspective, the achievement of the first research objective highlights that VC performance measurement remains a complex exercise. Still, the right choice of the appropriate performance measure as well as the handling of well-known pitfalls often represents problems to practitioners and methodological challenges for the researchers.

Beyond methodological issues, the next chapter is dedicated to the lack of large-scale data to investigate VC performance. This presentation not only gives guidance on general data availability but also on potential data limitations. Detailed performance (in particular on deal-level) is still hardly available and suffers from severe data biases. In anticipation of the own empirical analysis, the most relevant limitations are therefore discussed. The introduction to VC performance ends with a comparison of ex-ante expected and ex-post realized VC returns. Interestingly, there seems to be a “de-coupling” of risk and return within the VC asset class. Venture capitalists that focus on very early stage investments are on transaction-level rarely compensated for the additional risk they take. More importantly, overall as an asset class VC produced only mediocre returns that do not cope with the fundamental investment risks. This finding motivates the subsequent empirical analysis to gain a deeper understanding of the drivers behind VC investment success.

At the beginning of the literature-based analysis of individual performance drivers (*chapter 3.2*) therefore stands the development of a suitable framework. Four key areas are presented to which identified success factors can be allocated to: VC firm related, portfolio company related, VC contracting related and market related factors. Accordingly, the relevant literature is selected in order to comprehensively discuss fundamental performance drivers for each these area. For this purpose, the relevant empirical results of seminal studies are summarized and discussed. *Firstly*, considering characteristics of the venture capitalist the performance implications of VC activism, VC experience, specialization and reputation as well as the ability of the venture capitalist to network and syndicate deals are presented. *Secondly*, from a portfolio company perspective, the analysis is less focused on idiosyncratic factors, i.e. very specific characteristics of an individual performance driver like the execution skills of the management or the fundamental technology risk of single a product. In contrast, the analysis concentrates on

more general performance drivers like the affiliation to a specific industry or the corporate stage of the target company at the time of the investment. *Thirdly*, the major contractual features that determine the relationship between a venture capitalist and his portfolio companies are examined. To which extent investment performance is affected through the utilization of a diversity of investment rights, staged financing or the utilization of convertible securities is discussed. *Fourthly*, market related factors are evaluated. This group of investment success drivers comprehends a variety of determinants that are “outside” of the individual venture capitalist-portfolio company relationship.

Reflecting on the empirical results of venture capitalist related factors, one might be tempted to (prematurely) conclude that a “more” of everything seems to be promising with regard to investment performance. More activism, more experience and specialization, ultimately more reputation all framed by more networking and syndication seems to be the “holy grail” of VC investing. Indeed, most of the previous research seems to confirm the common wisdom that whoever produced superior returns in the past, will do so in the future: This means that the most established venture capitalists which have previously proven high competencies with regard to the outlined skills, should be able to consistently demonstrate outperformance compared to its competitors.⁴¹⁹ Put simply, suchlike venture capitalists are capable to source from a larger pool of interesting opportunities, structure their transactions more efficiently, guarantee fast and effective execution of the business strategies (by means of superior activism and monitoring skills), and finally harvest most promising exit returns due to superior signaling effects.

However, looking at some of the results in more detail this implication can at least partly be challenged. First of all, the positive impact of single VC-related value drivers seems to be less clear on closer inspection. Exemplarily, a high degree of specialization, i.e. the pursuit of a narrow investment focus, holds the potential to capitalize the most on favorable investment conditions. Often, knowledgeable venture capitalists are capable to channel their investment activities early on in up-raising industries or technologies. This time advantage ultimately bears the potential for superior investment returns. However, such a narrow focus embraces the risk of suffering the most the moment that the fundamental industry prospects deteriorate. In such a situation, specialized venture capitalists face substantial “cluster risk”.

⁴¹⁹ Cf. Kaplan and Schoar (2005); Phalippou (2010); Smith, et al. (2010).

In addition, the respective results need always be assessed under close consideration of the respective time period, geography and utilized database. Hence, syndication could have been in particular fruitful in the healthcare industries throughout the 1990s as knowledge and skills of multiple investors were aggregated to transform initial research ideas into sustainable publicly listed companies. Due to the enormous capital intensity of these businesses, the capability to syndicate was an important success factor. These days, the majority of fund flows is rather concentrated on “asset-light” business models like social media, software or cloud-computing. Accordingly, the importance of syndication is possibly far less a competitive advantage.⁴²⁰ Nevertheless, syndication still seems to be an important strategy to gain access to most promising investment opportunities. This way, syndication is frequently applied as a strategy to achieve reciprocity. As a venture capitalist (or a group of venture capitalists) allows other investors to participate late in a corporate success story, he typically hopes himself to be invited to invest in a promising company at another occasion in return.

Overall, research suggests the existence of performance persistence with regard to fundamental VC characteristics like experience, specialization or activism. However, the “half-value period” and hence the competitive advantage of suchlike skills need relentlessly be questioned. Potentially, a winning margin can only be maintained if the venture capitalist is capable to establish procedures that allow him to timely capitalize on the newest market trends and connected founding activities. Therefore, it is indispensable to secure the continuous access (and recruitment) of adequate human resources.⁴²¹ Hence, investors in VC are certainly well advised to allocate their money into funds of most experienced venture capitalists. However, the sustainability of experience needs to be continuously challenged as industry prospects frequently change.

With regard to general portfolio company related factors, an explicit focus on early stages hardly pays off from a financial return perspective. This is a crucial result as it fundamentally challenges the assumption that venture capitalists have the ability to support ventures through the provision of proprietary value-add. Thereto, it could be shown that experience comes up with limited potential to mitigate this stage-related issue. Accordingly, it is assumed that venture capitalists increasingly shift towards later stages. Some momentum of this development is

⁴²⁰ Cf. Holstein (2012).

⁴²¹ Cf. Söderblom and Wiklund (2006), p. 34.

already reflected in latest data for the US VC market. Accordingly, seed investments dropped sharply in 2011 by approximately 47% whereas investments in the later stage increased by more than 38%.⁴²² Data for the German market reveals the largest gap of VC funding for the seed and start-up stages.⁴²³ Aside, the spectacular success of venture capitalists that focus on very late stages of the corporate cycle should further promote this development.⁴²⁴ With regard to the industry, it could be shown that the choice of the right industry is more important to achieve attractive returns than the requirement to select the right company early on.⁴²⁵ Consequently, by and large pre-investment selection skills prove to be more important than post-investment value-adding activities.

The examination on the performance impact of contractual arrangements that are typically utilized within VC investing reveals limited testimony on a substantial impact. It is shown that the use of investment rights, convertible financing and stage financing is about to reduce probability of unfavorable investment events. In addition, they often provide an appropriate mechanism to align the interest of the venture capitalist and the entrepreneur(s). The question remains whether the exercise of suchlike rights represents an effective medium to bring a struggling venture back to success. Hence, it can be doubted that, e.g., the right to replace key employees will have a positive impact on turnaround probability. In particular, earlier stage companies are usually strongly dependent on these individuals as they internalize large parts of the venture's "asset base".

Altogether, the analysis in the context of research objective #1 has revealed market factors to be of great importance. Hence, the second primary research objective (#2) has been pursued by means of a research paper which is explicitly dedicated to the analysis of the impact of market volatility on VC investment performance (*Essay 1, chapter 4*). The empirical analysis shows a clear dependency between external market factors and the individual investment suc-

⁴²² NVCA (2012a), p. 30.

⁴²³ Cf. Achleitner, et al. (2010), p. 64.

⁴²⁴ The case of the US based VC firm Andreessen Horowitz stands for this development. The company achieved enormous success entering very late, i.e. on already very high valuations, in companies that were shortly thereafter listed at the public market or sold to a strategic investors. Samples include Skype (sold to Microsoft in 2011), Groupon (IPO in 2011) or Facebook (IPO in 2012). For the matter of completion it has to be noted that Andreessen Horowitz also invests in early stages. However, the latest fame the company received from VC industry participants clearly arises from the very late stage investments.

⁴²⁵ Cf. Ick (2005), pp. 15-16; Rosenbusch, et al. (2012), p. 35.

cess. This is remarkable as it puts the previous discussion on venture capitalist, portfolio company and contracting related factors to some extent into perspective. Hence, looking at the own empirical data the ability to exit an investment by means of an IPO is most fundamental to the financial investment success. Historically, a large part of VC returns have been harvested through public listings.

Looking at the relationship of VC market related factors and investment returns, multiple arguments could further be identified that strongly suggest the pursuit of an anti-cyclical investment strategy. As IPOs have shown to periodically appear in “waves”, an anti-cyclical strategy bears the potential to run into a favorable capital market environment at a time where the portfolio company is sufficiently “exitable”. Besides, as the valuation of the venture, which is crucial for the calculation of the resulting ownership share of a venture capitalist, is largely dependent on public market considerations, investments in market periods of an economic downward trend can potentially be foregone at a bargain. Finally, suchlike market periods are typically characterized by substantially less competitive bidding tension as in particular market-sensitive investors like CVC programs cease their investment activity.

Market overreaction is another important driver which has been found to severely affect VC investment success. Building upon preliminary studies on the money chasing deal phenomenon, the consequences of a mismatch of supply and demand on the market for VC has been analyzed by means of a proprietary data set.⁴²⁶ In contrast to previous deal-level focused analysis it is shown that overreaction, i.e. the massive inflow of VC funding into particular industry sectors during peak markets can be assessed as a major driver of poor investment performance. In analyzing the historical interaction of demand and supply on the VC market, the study finds that rising demand for VC, i.e. an increase in entrepreneurial activity, initially results in higher returns. However, in many cases an inappropriate reaction by venture capitalists made investment returns move in the opposite direction. Hence, overfunding, specifically overinvesting seems to be a recurring characteristic of the VC industry. Consequently, venture capitalists are well advised to pursue proprietary investment strategies (build upon superior knowledge and creativity) instead of being tempted to follow the herd. Consequently, tendencies to limit the own fundraising and investment activities might not only provide a strong tool to secure one’s own

⁴²⁶ Cf. Gompers and Lerner (2000b); Gompers, et al. (2008); Nahata (2008).

investment performance, but also be a valid instrument to re-establish VC as a more attractive asset class per se (see outlook section).⁴²⁷

Extending on exit market related factors *Essay 2* is dedicated to the third (#3) research question that aims at a better understanding of VC investment returns from acquisition exits (*chapter 5*). As previously noticed, this exit type has become increasingly important over the last several years. For a broad range of new ventures, an acquisition exit often is the last option to be successfully divested. Through the introduction of seminal M&A literature to the field of VC, the study achieves to provide first insights into performance mechanisms of acquisition exits.

Foremost, the results indicate that the strategic considerations of the respective buyer influence the venture capitalist's return potential. Hence, building upon arguments with regard to industry relatedness the study finds that a lateral acquirer, i.e. a strategic acquirer that is not yet active in the portfolio company's field of business, yields higher returns than dealing with synergetic acquirers from similar industries and fields of business. The analysis reveals also that within the group of synergetic trade sales, horizontal acquirers, operating in the same process step of the value chain, pay higher prices for a given company than vertical acquirers from different value chain process steps.

Knowledge about these differences should help venture capitalists choosing the right strategy to optimize investment returns early within the investment process. In addition, acquisition exits often are the only option for ventures that operate in markets whose stand-alone size is too small to be a sufficient fertile soil to breed sustainable businesses. In these markets, a pre-planned trade sale strategy that focuses on the most interesting strategic buyers early-on is of special interest. Knowing about the best trade sale strategy provides guidance on how to position the portfolio company best in order to generate as much return as possible. A controversially discussed example for someone who has capitalized on a comparable strategy is the German incubator Rocket Internet. Since its inception, this VC has repeatedly succeeded with pre-planned acquisition exit strategies. Knowing that the German domestic market potential would not be sufficient to pursue a stand-alone business strategy, several ventures were early on "designed" to be clear take-over candidates for the original US archetype.

⁴²⁷ Cf. Kaplan and Schoar (2005), p. 1822.

6.2 Outlook and Future Research

Looking at the returns of VC in recent years, one could pointedly talk about a “lost” decade. As a consequence of disappointing investment results, the asset class VC faces substantial headwinds these days. From a practical perspective, it can already be observed that fund flows to VC start to fall behind allocations to competing asset classes like buyout investments. According to most recent data from the NVCA, the ratio of VC versus total private equity commitments has dropped sharply. Hence, for the period 1985 through 2000, VC ended up with approximately one third of total committed capital compared to that of the entire private equity industry. This ratio dropped significantly to 23% for the period 2001-2011 and even more if only the period from 2006-2011 is considered (18%).

Reflecting on these developments, one of the most reputed VC researchers, Harvard Business School based JOSH LERNER, began to draw different scenarios for the future of the VC industry. As a result, he presents four different scenarios: “Recovery”, “Back to the Future”, “A Broken Industry” and “The Limited Partners’ Desertion”. Each of these scenarios varies with regard to (a) the ability of the VC industry to achieve reasonable returns and (b) the extent to which the investor base, i.e. the providers of capital, changes.⁴²⁸ This analysis is illustrated by Figure 6-1.

	Constant Investor Base	Turnover in Investor Base
“Fair” Returns	Recovery	Back to the Future
Disappointing Returns	A Broken Industry	The Limited Partners’ Desertion

Figure 6-1: Four Scenarios for the Future of the VC Industry.⁴²⁹

The “Recovery“ scenario suggests that the recent performance disappointments are the result from repeated occurrence of boom and bust patterns that characterized the VC industry since its inception. Similar to the results of this thesis (*Essay I*), this scenario assumes that core industry fundamentals work properly, i.e. that the investment approach of VC in general contains

⁴²⁸Cf. Lerner (2011) p. 424.

⁴²⁹ Source: Based on Lerner (2011) p. 424.

a well-defined value proposition; an argument that is encouraged by the result that a better pool of investment opportunities seems to improve VC returns as long as there is no severe mismatch between demand and supply emerging. For the future, these considerations would lead to a recovery of investment returns the moment a balance between demand and supply is once again sustained. Ultimately, equilibrium of fair returns will only be achieved once the VC market continues to shrink and stabilizes as a financial niche market that just matches the degree of innovation and creativity of real investment opportunities. For the future, additional research on how VC can actually spur innovation and which alternative drivers (e.g. governmental programs) should be fostered in order to increase the overall level of entrepreneurial activity is highly recommended.

The other rather positively laid out scenario (“Back to the Future”) results in market conditions as they were predominant throughout the 1980s. This outlook is primarily driven by the diagnosis that today, more than ever, returns from VC are highly skewed. As a result, only a small group of elite investors are capable to achieve attractive returns. Accordingly, this scenario is in particular backed by the own findings regarding the importance of venture capitalist-related performance drivers. Solely, most reputed players which maintain a competitive edge by means of exceptional knowledge and experience, and which gain access to most promising ventures through superior networking skills, will survive. This development is supported by the fact that many VC investors have begun to substantially cut back and/or re-focus their VC commitments. A recent statement by the Kauffman Foundation, one of the most sophisticated US VC investors, delivers additional evidence: „To fix what’s broken in the LP investment model institutional investors will need to become more selective and more disciplined investors in venture capital funds. The best investors will negotiate better alignment, transparency, governance, and terms that take into account the skewed distribution of VC fund returns.”⁴³⁰ Initial feedback from private equity practitioners already indicates that their investors continue to professionalize and hence challenge fundamental investment strategies more rigorously. Which impact this development will have not only on the overall VC landscape but ultimately on returns from VC investments provides another interesting avenue for future research.

For the “Broken Industry” and the “Limited Partners Desertion” scenarios, LERNER assumes that the VC industry will continue to be characterized by disappointing investment results. Most

⁴³⁰ Mulcahy, et al. (2012), p. 4.

dramatically, the “Broken Industry” scenario ends in a solidification of the current status quo. Although VC is not capable to achieve attractive returns venture capitalists continue to raise substantial amounts of new funds. This might happen for two reasons: First, the previously reported measurement issues of commonly used IRR and/or cash multiples distract VC investor to properly assess actual VC performance. This is further hindered by “the long lags associated with assessing performance and the poor measurement of risk”.⁴³¹

In addition, this development could be further manifested by the investment behavior of large institutional investors that are resistant to recommend fewer funds allocations. An assessment which is perfectly reflected in the provocative question that is raised by the Kauffman Foundation in their self-critical analysis: “Do LPs have the interest, engagement, and will to actually be different and more selective investors in VC?”⁴³² If the answer would be yes, the “Limited Partners Desertion” scenario becomes more likely. Looking at historical returns, LPs might conclude that it is inherently impossible to earn a reasonable, risk-adjusted return. As institutional investors gradually abandon the VC asset class, future venture financing will be increasingly provided by rather informal sources of capital. In such a scenario additional research that aims on the assessment of the general potential of the informal VC market is highly recommended.

Looking at the major findings of this thesis, an own assessment with regard to the likelihood of the outlined scenarios remains difficult. However, VC is certainly not only around to generate attractive returns to investors. As VC has proven to foster innovation and to create competitive jobs, a future scenario is desirable where VC remains an important driver of economic growth.

Apart from research that is closely connected to the four grand scenarios for the future of the VC industry, the thesis motivates towards several other important streams of future research. Hence, although, the thesis made a case in favor of acquisition exits as an attractive alternative to IPOs, a comeback of capital markets that are bullish to participate in the future of rising companies is essential for the long-term prosperity of the VC asset class. However, since the last large-scale IPO window has passed, public investors almost certainly reconsidered their investment criteria. An updated analysis of the critical criteria that VC-backed companies need

⁴³¹ Lerner (2011), pp. 429-430.

⁴³² Mulcahy, et al. (2012), p. 48.

to achieve in order to gain access to the broader IPO market is therefore highly recommended.⁴³³ This interest is further justified by recent data from the NVCA: 92% of jobs that are created by VC-backed companies are created after the IPO. Hence, if companies are either forced to or choose to be acquired society keeps on “sacrificing significant job growth over the long term”.⁴³⁴

At the same time, disappointing returns over a longer period of time almost naturally demand for the reconsideration of existing governance and compensation structures. Accordingly, several researchers start to seriously doubt the prevailing formulas that are used to calculate the gratification of the venture capitalist. Among others, “the model of paying a 2% annual management fee and 20% carried interest or performance fee may not be sufficiently incentivizing fund managers to seek the most profitable investments, as it may just be easier to rely on the management fees, especially when the funds are large enough.”⁴³⁵ Additional research on how the interests of the venture capitalist and his investors can be better aligned is therefore of interest. A potential solution to this issue could above all serve as catalyst for one or another of the discussed future scenarios for the VC industry.

⁴³³ Cf. McKenzie and Janeway (2011), p. 784.

⁴³⁴ NVCA (2012b).

⁴³⁵ Mulcahy, et al. (2012), p. 8.

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