The Bright and Dark Side of Staging:

Investment Performance and the Varying Motivations of Private Equity Firms

by

Philipp Krohmer*, Rainer Lauterbach* and Victor Calanog**

Abstract

Previous papers that examined investment decisions by private equity funds are divided on whether staging has a positive or negative effect on returns. We believe these opposing views can be reconciled by studying *when* staging is used during the life of the investment relationship: We find that staging has a positive effect on investment returns in the beginning of the investment relationship, consistent with the notion that staging helps mitigate information asymmetry. However, staging appears to be negatively associated with returns when used prior to the exit decision. Our unique dataset allows us to measure these intertemporal effects precisely.

JEL classification: G24; G11; G33

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* Goethe Universität Frankfurt, Finance Department
** Wharton Business School, University of Pennsylvania, Philadelphia

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Please address all questions or comments to corresponding author Philipp Krohmer, Department of Finance, Johann Wolfgang Goethe-University Frankfurt am Main, Germany and CEPRES Center of Private Equity Research, email-address for correspondence: philipp.krohmer@cepres.de We thank Venture Economics and CEPRES for generous access to data. Constructive comments were provided by Mark Wahrenburg as well as participants in seminars at the American Finance Association's 2007 meetings, the Global Conference on Business & Economics at the Harvard Graduate School of Education, the Global Finance Conference 2006, the HVB Doctoral Conference, and the brown bag seminars in Goethe University. We also thank the staff at the Wharton School's Lippincott Library for research assistance. All errors are our own.

Introduction

Staging involves the sequential disbursement of capital from a private equity (PE) or venture capital (VC) fund to a portfolio company, often dependent on whether companies receiving funding have satisfied predetermined targets. Our objective is to study whether the use of staging has a positive or negative influence on investment performance. Previous theoretical and empirical studies have yielded mixed predictions and results. Neher (1999), Hsu (2002) and Wang and Zhou (2004) provide theoretical models that predict positive returns from the use of staging. Gompers (1995) asserts that companies that successfully go public (and that earn the highest returns for their PE/VC investors) receive more total financing over a greater number of rounds than companies that go bankrupt or are acquired, providing empirical support for the optimistic view. On the other hand, Bergemann and Hege (1998) and Cornelli and Yosha (2003) suggest that there may be a theoretical basis for expecting negative returns from the use of staging. Hege et al. (2003) provide supporting empirical evidence, finding that the number of financing rounds appears to result in negative IRR and inferring that "… [their results are] at odds with standard manager-shareholder agency theory that predicts that stage financing and monitoring are value increasing."

We believe these opposing views can be reconciled by examining *when* staging is used during the life of the investment relationship: We define the beginning of the investment relationship as that point when the PE/VC fund provides the initial cash injection into the portfolio company and becomes a shareholder in the portfolio company. The end of the investment relationship is marked by that point when the PE/VC fund liquidates its investment in a particular firm, whether by taking the company public, selling the company in the private markets, or writing off the bad investment as a loss. Note that the life of the investment relationship is independent of the age of the portfolio company: A PE/VC fund may invest money in a start-up company that has yet to launch its first product, or in a 20 year old privately owned firm looking for financing to enable its expansion into different product or geographical markets.

Like any other investor, PE/VC funds are concerned with maximizing returns while minimizing risks. We speculate that investors disbursing capital at the beginning of an investment relationship may have different motivations and expectations compared to investors disbursing funds prior to making an exit decision. We test whether these different motivations and resulting behavior, manifested during the beginning and end of the investment relationship, explain the varying impacts of staging on investment returns. Given the intertemporal nature of our approach, it is necessary for us to measure the precise amount and timing of cash injections and withdrawals over the complete life of the investment relationship. No other study has been able to do this in the past because of data limitations. In order to address these difficulties, we rely on a unique database that we created using the combination of information on PE and VC deals from *Venture Economics* and CEPRES. Our results suggest that staging does appear to have a positive influence on investment returns when used at the beginning of the investment relationship. This is in line with standard agency theory, where investors apply staging as a monitoring instrument to mitigate agency problems and provide needed resources to the portfolio company. At the end of the investment relationship, however, we find that firms in distress receive more frequent rounds of cash injections as investors "gamble for resurrection," perhaps attempting various turnaround efforts in the hope of minimizing losses. We interpret this as the potentially "dark" side of staging, and offer a set of explanations as to why financing rounds may be inefficiently employed in this stage of the investment relationship, often not achieving goals of minimizing losses, and perhaps even as an attempt at window dressing to obtain the best price possible from whichever (unfortunate or uninformed) buyer ends up taking over the distressed investment.

The paper is organized as follows. Section 1 reviews the literature on staging behavior. In Section 2 we explain our empirical approach in defining various stages in the life of the investment relationship. Section 3 provides hypotheses regarding the influence of staging on investment performance, conditional on when staging is employed over the life of the investment

relationship. We describe the data in Section 4 and present analyses in Section 5. Section 6 concludes the paper. Tables and figures are collected in Section 7.

1 Literature

Several theoretical models explore how staging may influence investment performance positively, increasing efficiency in financial contracting and leading to optimal investment decisions both on the part of the investor as well as the entrepreneur. Admati and Pfleiderer (1994) develop a model of robust financial contracting, showing how inside investors like a PE/VC fund help resolve various agency problems that arise in multistage financial contracting. Neher (1999) argues that upfront financing may be suboptimal since the entrepreneur has an incentive to lower outside investors' shares of the enterprise through renegotiation once the investment is sunk. In this view, staging helps mitigate the commitment problem since early rounds of investment generate collateral that support future rounds. Hsu (2002) analyzes VC investments using a real options framework, concluding that staging not only gives the investor a "wait and see option" but also provides disincentives against underinvestment by entrepreneurs. Wang and Zhou (2004) show how staging for companies with high growth potential is superior to upfront financing, but qualify that upfront financing may be better for projects that are not too promising.

Other theoretical models provide reasons why staging may result in poor investment returns. Lerner (1998) discusses the Bergemann and Hege (1998) model and how portfolio companies' control over information flow limits benefits that funds may receive from using staging to elicit information about the firm's performance, concluding that "this appears to contradict the critical evidence in Gompers' empirical examination of staged financing." Cornelli and Yosha (2003) explore how staged financing creates a conflict of interest between the investor and entrepreneur, inducing the entrepreneur to focus on meeting the immediate hurdle of the next stage instead of focusing on long-term returns. They develop a model showing that this type of

window dressing by the entrepreneur reduces the investor's payoff because the refinancing/liquidation decision is based on lower quality information. Baker (2000) similarly concludes that managers have incentives to inflate interim returns, with career concerns reducing any efficiency benefits conferred by staging.

Empirical studies reflect these conflicting findings. Gompers (1995) provides evidence of the positive effects of staging, linking staging behavior with exit decisions. His paper studies investments from the perspective of portfolio companies, showing how companies that go public (his measure of "investment success") receive more total financing and a greater number of financing rounds. In an approach analogous to ours, Sahlman (1990) differentiates different stages in the company's development, including seed, startup, first to fourth stage, bridge and finally liquidity stage at the exit event. He finds that staging is a powerful instrument that influences the company's development (with positive results for investment returns). Note however that his definition of the life of the investment relationship is directly linked to the age of a particular company: As we stated in the introduction, our approach defines the life of the investment relationship based on when the PE/VC fund enters as a shareholder and liquidates the investment. This is independent of the age of the company.

Hege et al. (2003) provide empirical evidence that suggest that staging may have a negative influence on investment performance. They calculate investment returns from reported valuations in the *Venture Economics* database, suggesting that negative returns are associated with a larger total number of financing rounds. They point out that this result is at odds with standard manager-shareholder agency theory that predicts that stage financing and monitoring are value-increasing.

2 Empirical Strategy

In contrast to several of the previous studies that focused on the performance of portfolio companies, this paper focuses on the investor's concerns. Specifically, we measure particular

PE/VC funds' decision to inject capital into specific portfolio companies, capturing each capital injection from the fund to the portfolio company until the exit stage is reached and proceeds flow back into the PE/VC fund. From the investor's perspective the life of the investment relationship starts with the initial capital injection into the portfolio company. The investment relationship ends with the exit decision as capital is distributed back into the PE/VCfund. Investors can time their initial investment at any stage of a given portfolio company's development, whether in the early stages for seed financing, or in more mature stages (expansion or pre-IPO). Although PE and VC investments are frequently syndicated, implying that any one fund has only partial influence on the company's performance, each investor independently decides on whether to pull out and exit from the deal, or provide follow-on financing, implying specific influence on the return of individual fund investments.

PE/VC funds can use staging as an instrument that helps determine whether follow-on financing will be provided. Associated with this decision is the choice of what level of supervision and support to provide. At each round of financing, the fund decides on whether to exercise predetermined options like providing follow-on financing or abandoning the project and terminating the investment. Given the evolving nature of portfolio companies' performance, it is not unreasonable to assume that the investor's motivations to apply staging may change over time. This may lead to changes in the magnitude and frequency of cash injections, which implies variation in the impact of staging on investment performance. Our speculations about these different motivations and associated investment behavior will be introduced in detail in section 3 as we present our hypotheses.

As we focus on changes in staging behaviour and its impact on return on investment, we take a segmentation approach to enable us to measure changes in behavior. We segment the total life of every investment relationship into three time periods. A minimum of three phases is necessary and sufficient to allow us to observe changes in investment behavior within any given investment relationship. However, investment relationships have varying lifespans: For the

investments identified in this study, lifespans range from 2 to 8 years**.** To standardize the three phases for all investments, we cut the total life of the investment relationship into three time periods of equal length. This segmentation in sections of relative length is appropriate for empirical analyses across multiple investments by different investors in varying companies. While the actual terms and actions for each investment may not be the same, the underlying challenges within each of the three time periods are similar across all investments. We perform detailed analyses on the investors' staging behavior and its impact on investment returns for each of the three time periods separately.

During the first third of the investment relationship the investor provides the initial cash injection. By revealed preference and the assumption of individual rationality, the beginning of any relationship between an investor and the company is marked by an expectation of positive returns from both parties: Otherwise the relationship wouldn't have been started. We name this first phase the initial phase (*i*-phase). In the second third of the investment relationship, the company must prove its abilities to meet milestones and progress as anticipated. The relationship has matured and the investor has gained information about the company's strengths and weaknesses. We call this second phase the maturity phase (*m*-phase). During the final third of the investment relationship, the outcome of the investment will be realized. The investor and the company decide on the type of exit, whether it be the initiation of a listing at a public stock exchange, the private sale of the company, or termination of the investment, an option which carries with it the risk of letting the project slip into insolvency. As exit plans are prepared during this stage of the investment relationship, we call it the pre-exit-phase (*p*-phase).

Measurement of Financing Rounds and Tranches

We measure staging behavior in very precise terms: First, we quantify the number of financing rounds for all three phases of the investment relationship. However, in practice each financing round is further broken down into cash injections or tranches. Information about financing rounds alone without considering the underlying tranches would present an incomplete

picture of the complexities of staging behavior. Limiting the measurement of staging behavior to the level of financing rounds also implies a less precise measure of IRR given that cash flows occur *within* financing rounds. Having detailed information about *both* financing rounds *and* tranches allows us to examine the determinants of staging behavior and investigate how changes in staging behavior affect investment returns. Table 3 in the Section 7 presents summary statistics for the number of tranches for each financing round. The frequency of staging is clearly seen *across* financing rounds, but it is also evident that staging occurs *within* financing rounds. A company will receive several cash injections within a given financing round if it does not receive the complete amount of capital committed by the PE/VC fund upfront. Each financing round is an opportunity for the investor to make a decision whether or not to continue the relationship. Within each financing round, the investor can opt to cease any further cash injection if agreed milestones are not achieved; otherwise the investor is usually contractually obliged to finance all tranches until the current financing round is completed. Disaggregating the total amount of committed capital within each financing round into smaller cash injections gives the investor more control over how capital is allocated: An option to provide just enough cash to the company given its development needs is created, enforcing a more disciplined focus to reach goals that were mutually determined. Terms and conditions, which include estimates of company valuation, share and non-participation rights, are negotiated for each financing round but usually remain unchanged for each tranche.

Given the interrelated nature of tranches and financing rounds, we introduce a new measure in this study: The ratio of the number of tranches to the number of financing rounds from the fund to its portfolio company, which may provide an indication of what drives financing decisions for particular PE/VC funds. Suppose the total capital of the financing round is provided upfront rather than in several tranches: In this situation, the fund will have less control over portfolio company operations relative to when each tranche is payable upon completion of a milestone. We interpret a higher value of the tranche-to-round ratio as implying more

management intervention. A lower tranche-to-round ratio may be interpreted as an expression of the investor's confidence that the company does not need as much oversight, and will make optimal use of committed capital given contract terms.

3 Hypotheses and Predictions about the Influence of Staging on Investment Performance

The staging decision is essentially a signal of the investor's preference for the level of control it wishes to exercise, as well as the amount of resources it chooses to allocate. These resources may come in the form of capital, managerial support, knowledge transfer, time or effort. We analyze this active role of the investor and staging behavior with respect to the number of investments made, as well as the frequency, duration, amount and timing for each portfolio company. Given the active role that PE and VC funds as investors play, the type of staging decision as well as the motivations behind its use presumably has a direct impact on investment performance. We present an overview of the variables we examine in this paper in Table 1.

Initial Investment Phase (*i*-phase) Predictions

While previous papers focused only on staging behavior over the total post-investment period (mostly due to data limitations), our approach allows us to examine possible variations in the use of staging for each of the three phases. Do investors allocate a different level of resources across the different phases? As outlined earlier, we expect the *i*-phase to be marked by expectations about positive returns by both the PE/VC fund and the portfolio company, given the uncertainty of whether the investment will succeed or not. Information asymmetry is perhaps the most significant concern for the investor during the *i*-phase: The investor needs time to learn about the management team, the company's strengths and weaknesses and several other factors to better assess future prospects, and staged financing helps the PE/VC fund elicit the information it needs from the portfolio company. Staged financing may also play a critical role in mitigating moral hazard, given that it may induce higher effort from the entrepreneur. One reason for relatively high agency costs during the *i*-phase is the possibility that the entrepreneur might divert capital to

his private benefit given that he or she is now awash in cash. This is in line with Neher (1999), who argues that staging can reduce the hold-up problem.

Hellmann and Puri (2002) find that active investors play a part in a company's success, showing how VC-financed firms are more likely to professionalize in a shorter period of time by adopting stock option plans or by bringing outsider CEOs to run the company. Better information flow may also enable investors to react more quickly should things go awry (by enforcing changes to the management team, for example), and through this help to further improve the prospects of portfolio companies. During the *i*-phase, we argue that more staging mitigates agency costs and leads to higher investment performance.

Prediction 1 – We predict that a higher share of the number of financing rounds and tranches during the *i*-phase in relation to the total investment period is positively associated with investment returns.

There is some ambiguity as to whether capital investment and effort are complements or substitutes. It is quite possible for investors who shell out a large amount of cash to devote less time to a project, arguing that firms that receive less cash require more attention. This does not seem to be the case for the typical PE/VC fund, most of which tend to assume an active role in portfolio companies. For the purposes of this paper, we assume the complementary relationship, implying that the investment manager will align his allocation of effort and resources with his allocation of capital to the portfolio companies. Investors will inject a relatively higher amount of capital for the most promising firms during the *i*-phase and will provide relatively more support. We do not observe the investor's relative effort across every company in its portfolio, but we do observe relative amounts of capital investment for particular portfolio companies. This relatively higher amount of resource allocation, both in terms of capital investments and effort, during the *i*-

phase augurs well for the company's growth prospects *ceteris paribus*. All of this implies a positive impact on investment returns.

Prediction 2 – A higher relative share of investment amount during the *i*-phase will have a positive impact on investment returns.

Pre-Exit Phase (*p*-phase) Predictions

During the pre-exit phase the investor makes the final decision on how to exercise the exit or termination option in an optimal manner. For successful companies, the exit decision is primarily a question of the best time and way to sell valuable assets. For unsuccessful companies dependent on external financing, the investor's decision to terminate the investment relationship implies the possibility of having the portfolio firm become illiquid or insolvent. These investments are written off completely, appearing as a total loss in the investor's books, hurting reputations and possibly impeding future business and career prospects for both the investor and entrepreneur. Sunk cost fallacy aside, the entrepreneur and the investor put in tremendous effort to avoid a complete failure of invested capital and work. In critical situations, the survival of the company often depends on the willingness of the investment manager to inject further capital. The investment manager faces a significant agency problem in solving this *termination dilemma*: How to balance his own personal interest by seeking to avoid failure, against the limited partners' (LP) interest as principal to minimize losses in unsuccessful projects. Should the investment manager cut his losses or gamble for resurrection?

Technically, staging offers the investment manager the option to abandon poorly performing investments and minimize further associated expenses. However, an interesting dynamic arises during the *p*-phase. Given the passage of time and the application of staging and various mechanisms during the course of the investment relationship, the investor presumably has better information about the portfolio company's prospects relative to the *i*-phase. Between the *i*-

and *p*-phases it is often when *information about negative performance* is received that investors' attentions are focused: Investors typically seek out detailed reasons behind negative deviations from predetermined milestones. This is related to the idea in Bergemann and Hege (1998), where monitoring occurs when more information is produced, but note the *simultaneity* of monitoring and information acquisition: More information is demanded, produced and acquired when investors scrutinize the company's performance more closely, and negative performance is what invites closer scrutiny.

Closer scrutiny in the context of staging implies the imposition of either (a) more financing rounds, and/or (b) more tranches within financing rounds. A higher share of tranches during the *p*-phase can be interpreted as the investor seeking more control relative to earlier phases. This is usually an indication of negative company performance results in previous periods: Additional cash injections during the *p*-phase may be a signal that the company is not meeting milestones. Similarly, a high tranche-round ratio during the *p*-phase splits the round in more tranches so that the investor can have greater control over milestone accomplishments. A higher tranche-round ratio also implies *more options or opportunities* to abandon the project relative to previous phases, and should perhaps be considered by the ailing portfolio company a warning signal.

We arrive at one of the key findings of our paper. In critical situations the investor faces the *termination dilemma*: If he decides to abandon the nonperforming project he avoids incurring further costs, but also forfeits the possibility of a turnaround, ending up with some better return relative to what is currently expected. In critical situations, with portfolio companies dependent on external financing, the follow-on financing arrangement gives the company and the investor a termination grace period, allowing the investor one last chance to observe developments and come up with a plan to perhaps stimulate some improvement. We interpret increased staging during the *p*-phase as the investor providing stepwise grace periods and attempting to address the termination dilemma by postponing his decision to abandon nonperforming projects. This is in line with the

argument presented by Kahl (2002) where creditors – in our case investors – often lack the information that is needed to make a quick and correct liquidation decision. Kahl (2002) explains that the long-term nature of financial distress is the result of dynamic learning strategies of lenders and suggests that it may be an unavoidable byproduct of an efficient resolution of financial distress. While creditors may not see the negative impact of this postponement on performance due to the fixed nature of credit returns (assuming that default is in fact prevented or recovery upon default is 100%), the equity investor will suffer a reduction in IRRs due to the temporal dimension.

An increased amount of monitoring during the *p*-phase may therefore be associated with lower performance. An increased share of rounds during the *p*-phase may therefore indicate the distinct (and troubling) possibility that the investor was not willing to abandon the project in time.

Prediction 3 – During the *p*-phase, the relative share of financing rounds and tranches as well as the tranche-round ratio increases in critical situations

This is related to several strands of literature in behavioral economics and finance. According Kahneman and Tversky (1979), people underweight outcomes that are merely probable in comparison with outcomes that are obtained with certainty. This implies a tendency towards risk seeking in choices involving sure losses. If this holds in situations where a company's survival is in danger, the investment manager will prefer to shell out more cash to preserve the turnaround option, versus the sure loss of terminating a non-performing project. The tendency for risk seeking in choices involving sure losses leads to a higher share of financing rounds as well as a higher share of committed capital during the *p*-phase in critical situations.

Prediction 4 – The share of the investment amount during the *p*-phase increases in critical situations

4 Dataset Description

Given our need to measure the amount and frequency of financing rounds and tranches as well as investment performance, we required specific data points that were not available using conventional datasets used by previous papers that examined staging. To obtain the data we needed, we merged variables from *Venture Economics* (www.thomsonfinancial.com) - which is very comprehensive for each financing round but does not contain information about the separate tranches within each round - with variables from a database from the Center for Private Equity Research (*CEPRES*) (www.cepres.com), which provides details on each cash transaction using information collected from due diligence reports, inclduing audited filings of investment firms. *CEPRES* is a private consulting firm affiliated with the University of Frankfurt, Germany, and was formed in 2001 specifically to gather detailed fund- and industry-specific information on private equity and venture capital deals across different countries. The database is build on the funds' reporting and due diligence information, which is partially audited. Though not as comprehensive as the *Venture Economics* database (as of November 2003 CEPRES had detailed information for 5,300 deals), its efforts at combing through specific investment filings for particular funds yields valuable insight unavailable to other researchers in the past. The empirical studies of Cumming and Walz (2004), Cumming et al. (2004a) and Schmidt (2004) also provide more detailed information about the CEPRES database.

Previous papers that examined related issues in staging and investment performance also used either Venture Economics or CEPRES as a data source. Gompers (1995) worked with Venture Economics data to examine VC investments and financing rounds. His analysis could not include tranches because information on tranches is not available from Venture Economics. He uses a proxy for measuring performance by classifying the exit type and considering an exit via IPO as success. This measurement approach is imprecise: A highly valued trade sale can provide a higher return on investment than a poorly priced IPO. With information on cash flows from the CEPRES database, we can calculate a precise measure of internal rate of return (IRR).

Hege et al. (2003) define investment performance using valuations based on Venture Economics information. This definition of "IRR" is spurious at best given the nature of financing rounds and tranches: IRR measurements based on Venture Economics valuation data alone can lead to what Kaplan et al. (2002) call "milestone bias," which can materially affect researchers' estimates of returns and valuation patterns over time. Kaplan, et. al. (2002) call tranches or cash injections within a given financing round as "milestone rounds," and point out that the IRR is only technically meaningful when two important data points are identified: The precise timing of cash injections which occur *within* financing rounds, and the exact time when the investor cashes out. One can obtain the dates of financing rounds from Venture Economics but not the dates for cash injections. The exit date provided in Venture Economics also does not always overlap with the exact date of the cash flow distribution back to the investor.

Given our need to measure the influence of staging on IRR, we use financing round data from Venture Economics and combine this with accurate cash flow information for each milestone round (tranch) provided in the CEPRES database. CEPRES data provides precise information about each cash injection from the investor to the portfolio company and each cash distribution from the company back to the investor.

In November 2003, the CEPRES database had detailed information for 5,308 investments in 4,476 portfolio companies by 229 PE and VC funds belonging to 74 different investment management firms. We matched this with associated information on financing rounds from the Venture Economics database, ensuring that the specifics of each investment was consistent: The name of the investment manager, PE/VC firm, fund, and dates of investment of a particular investment manager into a particular portfolio company. Given that we wanted to control for type of industry, location of portfolio company, location of investment management, etc., we dropped any observations which had missing variable data. Since we are studying investment returns using a very specific definition of IRR (cash distributions, not just valuations), we dropped all unrealized investments and focused only on those deals that were consummated and which

involved a cash distribution back to the investor. We also drop any observations which involve cross fund investments since we want to study new investments for particular investment managers or funds to test our hypothesis about learning and monitoring especially during the *i*-phase. After ensuring that we had as complete a dataset as possible, we were left with **712** different investments made by **122** PE and VC funds belonging to **51** varying investment managers that we could use for our study. These investments include **1,549** financing rounds with **2,329** cash injections (tranches) spanning a period of **24** years from 1979 to 2003.

While **712** investment relationships are a small sample of the universe of PE and VC deals, we believe our sample is comparable to sample sizes examined by previous studies focusing on staging, exit decisions and investment manager behaviour. Gompers (1995) examined staging based on a sample of 794 venture capital-backed companies provided by Venture Economics. Lerner (1994a) analyzed 350 privately held venture-backed biotechnology firms in regards to the exit decision of venture capitalists. In a more recent paper, Kaplan and Strömberg (2004) study the investment analyses of 67 portfolio investments by 11 VC funds and find that greater VC control is associated with increased management intervention, which is in line with the results of our study. Our sample may also suffer from reporting bias, in that we observe only those deals where we have complete information about financing rounds and tranches, but given limitations of existing publicly available data and our objective of studying the effect of staging on investment returns we believe that this is a necessary sacrifice. Table 2 provides more detailed descriptive statistics about our sample, including some cross tabulations for industry, age and exit type.

5 Empirical Specifications and Analysis

5.1 Measuring Investment Performance

We measure investment performance by quantifying specific draw downs (cash injections) and distributions for each financial transaction. This detailed information about the complete chain of financing and the precisely dated cash flows enable us to perform exact IRR calculations. We perform the analyses from the investor's perspective from his initial cash injection through the final distribution to derive the IRR for each investment, which we then use to examine staging behavior. With our detailed data and our specific approach, we can then measure the influence of particular investor's staging activities on investment performance.

We calculate the natural logarithm of the IRR for the linear regression analyses to deal with asymmetric distribution of raw returns. Using ln(IRR+1,1) we can include the full spectrum of IRR results, from positive to negative figures as well as write-offs (IRR= - 100 %) analysis, the distributions of which we provide in Panel A of Table 2. We also see in Panel A that the mean absolute return of the PE and VC investments in our sample is 65.2%. If investors chose to place the same amount of cash injections at the same time periods into broad indices like the NASDAQ composite or the MSCI World Index, they would have earned 42.4% and 57.1%, respectively. Excess returns for PE and VC investments support the argument that the higher risk associated with these assets should be compensated by higher returns relative to broad indices composed of publicly traded securities. [1]

[1] Our analyses show similar results for absolute and excess return figures. Analyses with excess return figures are available upon request. We compare the return on the PE and VC investments with that of publicly traded securities and calculate excess IRR in the following way: (1) we choose the NASDAQ Composite index and MSCI World Index as the two closest comparable public indices. (2) We replicate the amount and timing of cash injections and distributions we observed in the PE and VC investments for the public indices, mimicking cash flow patterns for the publicly traded securities. Following this method we are able to compare and calculate value and time weighted excess returns for the two selected benchmarks. (3) To deal with asymmetric distribution of raw returns, we calculate the natural logarithm of the excess IRR for the linear regression analyses. (4) We omit the top and bottom 5th percentile to address extreme cases.

5.2 Descriptive Statistics and Analysis

Tables 4 to 6 provide descriptive statistics on staging behavior. We find that investing in tranches is a common strategy across all industry sectors, company stages, ages and types of exit. We find descriptive support for a higher number of financing rounds and tranches for companies at the early stage of development, as well as those that are less than one year old. We interpret this as a sign of investors needing to exercise more control and oversight for investments with higher uncertainty due to information asymmetry. Investors want to get to know more about how the firm operates and its future prospects, and uses staging as a tool to obtain more information and gauge performance. Once investors decide to exit, we also find that staging intensity is higher for investments with a negative IRR as well as write-offs. We interpret this support for the idea that tranches are used to control risk, perhaps to minimize losses or as turnaround attempts.

Table 5 gives descriptive statistics on the i-phase and the p-phase. Panel B of Table 5 shows the total tranche ratio (TTR), which is the ratio of the number of tranches by the number of financing rounds. A high TTR means that the investor sliced individual financing rounds into a relatively high number of small cash injections, injecting capital with tight control (a TTR of 1 implies a lump sum cash injection for a specific financing round). From the discussion above, we should expect higher TTRs in critical situations during the p-phase. The mean TTR of investments with negative returns is 2.26, which is (statistically) higher than the TTR of 1.75 of those with positive returns. The mean TTR is highest (2.27) for investments that were eventually written off. A high TTR can also be interpreted as a measure of the use of tranches to reduce information asymmetries. The mean TTR of high-tech sectors such as Healthcare/Life Sciences, IT, Internet and Media and Telecommunication as well for companies with an age of less than one year at the initial investment is relatively high. In those circumstances, a high ratio of tranches to rounds shows the effort of the investor to both mitigate information asymmetries as well as to frequently interact with the company to more quickly react to information that might lead to closer management or even abandonment of a losing project.

We find little correlation between staging behavior in the *m*-phase (the second or middle stage of the investment relationship) and investment performance. The most material differences which appear to affect investment performance are found in staging behavior during the *i*-phase and *p*-phase, which we explore further in Table 6. We find that companies with positive returns (IRR > 0) received on average about 82% of all tranches during the i-phase and only 7% during the p-phase. Positive IRR firms also received 78% of all financing rounds during the i-phase and just 6% in the p-phase, and obtained 89% of the invested capital during the initial investment phase as opposed to only 3% during the p-phase.

How does this compare to negative IRR investments, or write-offs? During the i-phase these losers receive almost similar relative levels of tranches, rounds and capital than the winners (see the bottom panel of Table 6). We find the most striking differences in the p-phase: Negative IRR investments receive almost three times more tranches (20%), and about three times the number of rounds (17%) than positive IRR investments. Negative IRR investments also receive about four times more of their share of total capital during the p-phase relative to positive IRR investments. Write-offs receive four to five times more tranches, rounds and capital during the p-phase than investments leading to any other type of exit. The most significant difference in the staging behavior during the i-phase versus the p-phase is shown in the mean relative tranche round ratio (RTR) figure: Winners (IRR > 0%) receive 1.19 during the i-phase and only 0.24 during the p-phase, meaning that the winners receive a very high relative number of tranche to round ratio during the i-phase and a low number of tranches and rounds during the p-phase. The losers (IRR <= 0%) receive with a mean RTR of 1.07 an almost equal level of RTR during the i-phase. On a relative scale, losers are associated with a tranche-to-round ratio that is almost three times higher than that associated with winners during the p-phase. In other words, winners and losers appear to receive an equal amount of capital, financial support and oversight at the beginning of an investment relationship. However, winners receive (or require) relatively little

support towards the end of the investment relationship, but losers require much more handholding (only to generate negative returns).

5.3 Control Variables and Empirical Analysis

With information about specific details of each investment relationship, we run empirical specifications that control for various observed heterogeneous factors. In particular, we specify control variables for the following:

Experience and regional focus of the specific investment management firm

The PE or VC firm acts as the investment manager for various funds. Several papers (Boot (1992), Gompers (1996), Kaplan and Schoar (2005)) argue that the investment experience of an investment manager affects the investment behaviour and the performance of the funds managed by him. We include two control variables for the PE or VC firm's experience: number of years in business (age) and number of funds raised (fund sequence) until the observed investment. Further we include an interaction term for where the PE/VC investment management firms are located (most of 51 firms we examined were located in the United States and Europe), given that other studies emphasize the relevance of local regulations and macroeconomic conditions on investment managers' choice of assets (Jeng and Wells (2000), Cumming (2002), Keuschnigg (2004), Bottazzi, et al. (2005)).

Type/identity of fund

We control whether the fund is a VC fund or not. Several studies have reflected on the special role of VC funds in terms of adding value to their portfolio company or managing their growth and innovation (MacMillan et al. (1989), Hellmann and Puri (2000), Jain and Kini (2000)). We also control for the impact of the fund size (Lerner and Schoar (2002), Cumming (2002)) and do not find any significant effect on investment performance.

Choice, type and timing of investments

We include six different control variables for specific investments.

1. Syndication may be a relevant factor that positively impacts investment returns (Lerner (1994b), Brandner et. al. (2002), Lockett and Wright (2003), Fluck et. al. (2005)). We control for syndication in our specifications by considering the number of investors in the initial round.
2. We control for the exit of the company via an IPO. Previous studies using Venture Economics data suggest that firms that go public yield the highest return on average.
3. We also consider the age of the company at the initial investment of the fund. Amit and Thornhill (2002) suggest that firms are at the greatest risk of failure when they are young and small.
4. We consider whether the portfolio company is active in the high technology industries where informational asymmetries are significant and monitoring is valuable as shown by Gompers (1995).
5. The particular stage of a portfolio company's development may impact information asymmetry and return on investment. We control for the stage of the company at the initial investment of the fund.
6. We also control for the use of convertible securities. Cornelli and Yosha (2003) illustrate an advantage of convertible debt over a mixture of debt and equity in stage financing situations. They argue that when the investor retains the option to abandon the project, the entrepreneur has an incentive to engage in window dressing and positively bias positively the short-term performance of the project, reducing the probability that it will be liquidated. They further explain that an appropriately designed convertible debt contract prevents such short-term focused behavior since window dressing also increases the probability that the VC will convert debt into

equity. Further support of the idea that the optimal financing of investment projects include convertible securities is provided in several previous studies, including Kaplan and Stromberg (2003), Biais and Casamatta (1999), and others.

Overall market conditions at the time of entry and exit

We consider the influence of total committed capital in the overall market at the time of initial investment by particular PE and VC funds in our sample. Several studies suggest that investing in "hot" markets affects the probability of success of specific portfolio companies. Inderst and Mueller (2004) as well as Gompers and Lerner (2000) suggest that "hot markets" increase the valuation of PE and VC funds' new investments, positively influencing the ultimate success of the portfolio company. Gompers (1995) argued that growth of the investment pool may measure entry by inexperienced investors. These new entrants may overinvest and may not monitor companies as effectively as experienced investors. We also consider overall market conditions at the time of exit. Cumming et al. (2004b) show that investors adjust their exit decisions based on liquidity conditions in IPO exit markets, most rushing to exist when markets are liquid, which can have a negative effect on performance.

Table 7 shows the results of our specifications with various control variables. The absolute performance of a specific investment [ln(IRR+1.1)] is our dependent variable. We performed several checks of robustness, which are available upon request. For example, we test the regression models with a data sample selecting only those investments made by VC funds (497 observations). These results are as robust as the analyses for the complete data set. All of the specifications pass various tests for linearity, Gaussian distribution of residuals and minimal collinearity and heteroskedasticity. Below we discuss our main results and whether they are consistent with the predictions we presented in Section 3.

Confirmation of Prediction 1: The results shown in table 7 confirm that the relative share of financing rounds and tranches during the i-phase has significant positive impact on investment

return. The underlying intuition is that more financing rounds as well as tranches enable the investor to monitor portfolio companies more closely, helping reduce agency problems. Staged financing may also induce higher effort from entrepreneurs (Wang and Zhou, 2004). Hellman and Puri (2002) also argue that active efforts by investors help engender more professionalism in company management. A higher share of financing rounds and tranches would enable investors to react quickly to new information, helping boost performance. If investors use cash injections as interactions for adding value to the company by providing advice and support, then we can infer that a higher share of tranches during the i-phase has positive impact on performance. Cuny and Talmor (2003) compare staged capital infusions in the form of milestones (tranches) versus rounds and found positive effects of staged financing in regards to the entrepreneurial effort and the VC's.

Confirmation of Prediction 2: Table 7's results also confirm that the relative share of investment amount during the i-phase (Pi Amount-share) has significant positive impact on investment return. This is consistent with Kaplan and Strömberg (2000), who provide evidence that the investor's initial appraisal of the management team is important. We also examine the influence of the initial investment amount both on an absolute level, and relative to the total investment amount. Both measures influence performance positively, consistent with empirical evidence presented by Hege, Palomino and Schwienbacher (2003).

Confirmation of Prediction 3: In various regression models we show that the relative share of financing rounds (Pp Round-share) and tranches (Pp Tranche-Share) as well as the tranche-round-ratio (Pp RTR) during the p-phase is negatively associated with investment performance. Sahlman (1990), Gompers (1995) and Wang and Zhou (2004) argue that staging is a powerful instrument for control, arguing that investors can use staging to abandon nonperforming projects. However, we appear to have found evidence that investors may not be using staging rigorously enough (or at least within a sufficient time frame) to abandon unsuccessful projects. The most pessimistic perspective would posit that fund managers may be

"window dressing" their portfolio to impress sponsors, injecting just enough cash to keep losing projects afloat. Lakonishok et al. (1991) show that fund managers tend to oversell stocks that have performed poorly right before their performance evaluations are conducted. Cornelli and Yosha (2003) show in a theoretical model how agents (in this case, the PE or VC fund) have an incentive to positively bias the short-term performance of a project, reducing the probability of liquidation. While holding on to bad investments hurts overall results, a "window dressing" approach may work in the interim, concealing poor performers from appearing in the track record and helping the fund manager maintain the good reputation required to raise the next fund (but reducing existing fund investors' returns).

Our results are merely suggestive. While we find that higher staging intensity in the p-phase is negatively associated with investment returns, an alternative explanation may well be that fund managers in good faith are injecting capital into struggling companies as a turnaround effort. Convincing empirical proof of window dressing needs to show, using an acceptable counterfactual, that investment returns would in fact have been higher had staging intensity not increased, or had termination occurred sooner, than it actually did. In a separate paper we explore the possibility of constructing such an acceptable counterfactual using propensity score matching, but we will explore these possibilities further in future research.

Confirmation of Prediction 4: The results in Table 7 confirm that an increase of the share of the investment amount during the p-phase (Pp Amount-share) is negatively associated with investment returns. This appears consistent with a sunk cost effect (Johnstone, 2003), where investors have a bias to commit to further financing and less of an inclination to terminate nonperforming projects. If this effect is operative, the share of financing rounds and of the amount during the p-phase might increase in critical situations. Brockner (1992) also explains that escalating commitment (in our case, more capital injections) refers to the tendency for decision makers to persist with a failing course of action. He argues that escalation is determined, at least

in part, by decision makers' unwillingness to admit that their prior allocation of resources to the chosen course of action was in vain.

The papers we cite to help explain why staging appears to be negatively associated with investment returns are written from the perspective of investor psychology, or behavioral finance. In this paper we are attempting to answer an empirical question, but in future research papers we hope to follow up with theoretical models that help explain the results we've found.

6 Conclusions

Our findings shed light on the bright and dark side of staging. Staging is a widely used tool in VC and PE financing to deal with information asymmetries, agency problems and the decision to terminate a nonperforming project. Previous studies have shown different directions of the influence of staging on performance. We merge data from Venture Economics and CEPRES to create a comprehensive, objective and accurate sample of 712 matched investments including 1,549 financing rounds and 2,329 precisely dated cash injections. We analyze the data for financing rounds and tranches and examine their influence on investment return measured using a precise IRR specification based on cash flows.

We segment the total investment relationship into three equal phases, examining the influence of staging on investment returns in each phase. We find significant positive influence of staging during the initial phase (i-phase). Our results suggest investors successfully use staging to mitigate agency problems and take an active hand in company management that may help boost the probability of success. We call this the "bright" side of staging. We find no evidence that staging behavior affects investment performance during the second phase (*m*-phase) of the investment relationship.

We find increased staging intensity during critical situations in the *p*-phase or pre-exit phase. We also find that staging intensity is associated with negative investment returns. We call this the "dark" side of staging and illuminate a critical dilemma that investors face, which we call

the *termination dilemma*: 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. We believe that investors may postpone their termination decision to learn more about the projects viability and name this postponement the grace period particular investors give to companies in which they've invested. However, we also believe that the investment manager faces a double-sided moral hazard if he or she decides to provide follow-on financing: The investment manager needs to cater to both the community of entrepreneurs in which he will find future investment opportunities, but also worry about providing good returns for fund investors. We argue that one way of balancing both needs is to "window dress" nonperforming projects in the interim, to avoid showing a loss in the track record. This is perhaps the most pessimistic view of what investment managers tend to do when faced with nonperforming projects.

Our results suggest that investment managers may need to be more disciplined in using staging to abandon negative NPV projects. The best investment that PE and VC funds can make may well be to allocate more time and effort in the beginning of an investment relationship: Assuming they can identify potential winners well, investment relationships appear to benefit much from close oversight and management in the *i*-phase. Should things take a turn for the worse for particular portfolio companies, investment managers may want to disburse follow-on financing more carefully.

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7 Tables and Figures

Table 1 Variable Names and Descriptions

		Variable Name	Variable Description
Dependant variables	Performance Measures	IRR [Log(IRR+1.1)]	The exact IRR (Internal Rate of Return) based on the investment cashflows [For the regression analysis we take logs of (IRR+1.1)]
		EXIRRnasdaq [Log(EXIRRnasdaq+6)]	Excess IRR of the Private Equity- investment over a simultaneous investment in the NASDAQ Composite Index [For the regression analysis we take logs of (EXIRRnasdaq+6)]
		EXIRRmsci [Log(EXIRRmsci+3)]	Excess IRR of the Private Equity- investment over a simultaneous investment in the MSCI World Index [For the regression analysis we take logs of (EXIRRmsci+3)]
Staging - related variables	Total Staging	Total Duration	Total Duration between the initial investment and the exit date in years (if not fully realised we consider the valuation date instead of the exit date)
		No.of Rounds	Total Number of Financing Rounds the company received
		No.of Tranches	Total Number of Tranches (cash injections) the company received
		Staging-Intensity (Rounds)	The Staging-Intensity (Rounds) is the ratio No.ofRounds/TotalDuration
		Staging- Intensity (Tranches)	The Staging-Intensity (Tranches) is the ratio No.ofTranches/TotalDuration
		Average Duration (Rounds)	Average Duration between Rounds (which is the ratio TotalDurarion/No.ofRounds)
		Average Duration (Tranches)	Average Duration betweenTranches (which is the ratio TotalDuration/No.ofTranches)
		Average Round- Investment [log]	The average Round- Investment is the total investment amount (in real 2003 U.S. Dollars)* divided by the No.of Rounds [for the regression analysis we take logs]
		Average Tranche- Investment [log]	The average Round- Investment is the total investment amount (in real 2003 U.S. Dollars)* divided by the No.of Tranches
	Initial Round	Initial Round amount [log]	The amount of this fund in its initial investment round in this company (in real 2003 U.S. Dollars)* [for the regression analysis we take logs]
		Initial Round amount/Total Investment	Relative Initial Round amount (The amount of this fund in its initial investment round in this company divided by the total amount the fund invested in this company)
		Initial Round No.of Investors	The Number of Investors which participated in the Initial financing round by this fund
		Initial Tranche amount/Initial Round amount	The ratio of the Initial Tranche and the Initial Round
	Investment Phases	TTR	Total Tranche Ratio (TTR) which is the ratio of No.ofTranches/No.ofRounds
		Pi Tranche-share	The share of the No.of Phase i (investment phase) tranches of the total No. of tranches (Pi Tranches / All Tranches)
		Pm Tranche-share	The share of the No.of Phase m (maturing phase) tranches of the total No. of tranches (Pm Tranches / All Tranches)
		Pp Tranche-share	The share of the No.of Phase p (pre-exit phase) tranches of the total No. of tranches (Pp Tranches / All Tranches)
		Pi Amount-share	The share of the Phase i (investment phase) amount of the total amount (Pi amount / Total amount) [all amounts in real 2003 U.S. Dollars]*
		Pm Amount-share	The share of the Phase m (maturing phase) amount of the total amount (Pm amount / Total amount) [all amounts in real 2003 U.S. Dollars]*
		Pp Amount-share	The share of the Phase p (pre -exit phase) amount of the total amount (Pp amount / Total amount) [all amounts in real 2003 U.S. Dollars]*
		Pi Round-share	The share of the No.of Phase i (investment phase) rounds of the total No. of rounds (Pi rounds / All rounds)
		Pm Round-share	The share of the No.of Phase m (maturing phase) rounds of the total No. of rounds (Pm rounds / All rounds)
		Pp Round-share	The share of the No.of Phase p (pre-exit phase) rounds of the total No. of rounds (Pp rounds / All rounds)
		Pi RTR	Phase i (investment phase) Relative Tranche Ratio.**
		Pm RTR	Phase m (maturing phase) Relative Tranche Ratio.**
		Pp RTR	Phase p (pre-exit phase) Relative Tranche Ratio.**
Other Control- variables	IM	IM Age	The age (years in business) of the Investment Manager at time of Initial Investment
		US-IM	A dummy variable equal to 1 for Investment Managers with the main office in the United States
	Fund	VC-Fund	A dummy variable equal to 1 for Funds specialized on Venture Capital
		Fundsize	Fundsize (in real 2003 U.S. Dollars)*
	Investment	No.of IM	Total No. of Investment Managers invested in the Company
		IPO	A dummy variable equal to 1 for Investments in private Companies that had an IPO (initial public offering) as exit
		Age of Company	Age of the Portfolio Company (in years since founding date) at date of Initial Investment by the Fund
		High Tech	A dummy variable equal to 1 for Companies of the High Tech - Sector [The Company was classified as High Tech, when belonging to one of the following CEPRES Sector categories: healthCare/LifeScience, IT, High Tech, Semiconductor, Software, Internet, Telecommunications]
		Later Stage	A dummy variable equal to 1 for Later Stage Companies [The Company was classified as Later Stage (early stage), when belonging to one of the following CEPRES Stage categories: Later, MBO/MBI, LBO, public to private, Mezzanine, turnaround, recapitalisation (seed, startup, early, expansion)]
		Use of Convertibles	A dummy variable equal to 1 if the investor held a convertible security [the use of convertibles was assumed, when more than 3 periodic disrtibutions occured to the Investor prior to exit/valuation]
	Market	No. Of IPOs	Number of (PE-backed) IPOs at date of exit/valuation
		Comitted Capital	Comitted Capital on the Overall Market at Date of Investment (in real 2003 U.S. Dollars)*

* The inflation adjustment is based on Consumer Price Index (CPI) data for all urban households and all items. Data is derived from the records of U.S. Department of labor (www.bls.gov)

** The Relative Tranche Ratio (RTR) for the Phase n (n = i, m, p) is calculated as follows: RTRn=PTRn/TTR with PhaseTrancheRatio(n) [PTR(n)] = No.ofTranches Phase n/No.of Rounds Phase n

Table 2 Descriptive IRR Statistics for the Total Sample and various Subsets

The two tables summarize performance (IRR) figures for the complete sample of 697 PE and VC investments. The IRR calculation is based on the precise cashflows between the fund and the portfolio company from the initial cash injection from the fund to the portfolio company until the final cash distribution from the company back to the fund. One observation is per company and not per financing round. **Panel A** shows in the left column percentile characteristics and in the right column the mean, median and other statistics. Skewness and Kurtosis values reveal non-normal distributions of the IRRs. In **Panel B**, several subclusters are considered for the analyses of structural differences. Variable description at table I.

Industry Cluster:
The 25 industry classifications provided by CEPRES were aggregated in the following 10 subclusters (comprising CEPRES categories in brackets): 1) Consumer discretionary (Consumer industry/food, Hotel. Leisure, Retail, Textile); 2) Financial Services (Financial Services, Fund of Fund Investments) 3) healthCare/LifeScience 4) Industrial Production (Industrial/Manufacturing, Construction, Traditional Products,) 5) IT (IT, High Tech, Semiconductor, Software) 6) Internet&Media 7) Materials (Materials, Natural Resources/Energy), 8) Services (Environment, Logistics, Waste/Recycling) 9) Telecommunication 10) Others (others, other Services).

Stage Cluster:
The 15 stage Classifications provided by CEPRES were aggregated in the following 4 subclusters comprising CEPRES categories in brackets): 1) Early (seed, start up, early) 2) expansion (expansion, acquisition financing) 3) Later (Later, MBO/MBI, LBO, public to private, Mezzanine), 4) turnaround (turnaround, recapitalisation). The CEPRES categories Spimoff, public and secondary trading do not appear in our sample and therefore no cluster-classification was needed.

Panel A

Internal Rate of Return (IRR)			
	Percentiles	Valid	697
1%	-1.000	Missing	15
5%	-1.000	Mean	0.652
10%	-1.000	Minimum	-1.000
25%	-0.879	Maximum	90.743
50%	0.095	Median	0.095
75%	0.471	Std. Deviation	4.544
90%	1.562	Variance	20.651
95%	3.862	Skewness	13.073
99%	15.754	Kurtosis	231.834

Panel B

	IRR of Investment			
	N	Mean	Median	Std. Dev.
All Investments	697	0.65	0.09	4.54
Industry Cluster				
Consumer Discretionary	47	0.11	0.17	0.88
Financial Services	12	0.46	0.37	0.36
HC/LS	117	0.67	0.09	3.43
Industrial Production	65	0.06	0.20	0.65
IT	178	1.60	0.05	8.00
Internet & Media	78	0.26	0.12	1.57
Materials	14	-0.01	-0.03	0.68
Services	5	0.02	0.28	0.79
Telecommunication	63	1.01	-0.27	4.05
Others	91	-0.03	0.03	1.01
Stage Cluster				
early	224	0.28	-0.42	3.37
Expansion	110	0.48	0.22	1.89
Later	128	1.52	0.21	8.46
Turnaround	13	0.02	0.31	0.63
Age Cluster				
<=1 year	218	0.59	-0.03	3.91
2 to 5 years	169	0.70	0.06	3.25
6 to 20 years	91	1.67	0.08	9.78
older than 20 years	35	0.27	0.29	0.74
Exit Type Cluster				
IPO	80	1.88	0.62	3.64
Sale/Merger	359	0.66	0.16	2.90
Write Off	153	-1.00	-1.00	0.00
else/not specified	105	2.09	0.33	9.58

Table 3 Tranches by Financing Rounds and Return on Investment

The table presents summary statistics for the number of tranches by the number of financing rounds. PE and VC funds can provide the financing of their portfolio companies not only in a single upfront investment, but rather in several financing rounds (between round financing), which can be partitioned further into several cash injections (within round financing), called tranches. Rows 4-8 show various summary statistics for 5 subsets differentiated by the number of rounds. Figure are given for the entire sample of 697 VC and PE investments (columns 2-7), and for the subsets of investments with IRR<=0 (columns 8-13) and IRR >0 (columns 14-19). For explanation: 65 companies out of the data sample have received three rounds of financing during the entire investment period from the initial cash injection by the fund to the portfolio company until the final cash distribution back from the company to the fund. These three rounds were on average (mean) partitioned into 4.12 tranches. The IRR is measured on the precisely dated cashflows between the fund and the portfolio company.

	No.of Tranches					
	N	**Mean**	**Median**	**Std. Dev.**	**Max.**	**% of Total N**
No. of Rounds	*Total Sample*					
1 Round	370	2.05	1	1.71	12	53.10%
2 Rounds	141	3.11	3	1.82	9	20.20%
3 Rounds	65	4.12	4	2.44	18	9.30%
4 Rounds	48	5.04	5	2.46	14	6.90%
5 or more Rounds	73	7.77	7	3.58	18	10.50%
Total	697	3.26	2	2.77	18	100.00%
	Subsample: IRR<=0					
1 Round	147	2.50	2	2.04	12	21.10%
2 Rounds	65	3.48	3	1.98	9	9.30%
3 Rounds	35	4.43	3	2.80	18	5.00%
4 Rounds	30	5.57	5	2.79	14	4.30%
5 or more Rounds	38	7.45	6.5	3.46	17	5.50%
Total	315	3.80	3	2.91	18	45.20%
	Subsample: IRR> 0					
1 Round	223	1.76	1	1.37	9	32.00%
2 Rounds	76	2.79	2	1.63	8	10.90%
3 Rounds	30	3.77	4	1.92	9	4.30%
4 Rounds	18	4.17	4	1.47	6	2.60%
5 or more Rounds	35	8.11	8	3.72	18	5.00%
Total	382	2.82	2	2.57	18	54.80%

Table 4 Tranche and financing round characteristics by various sub-samples for the entire investment period

The tables present summary statistics for several staging related variables for the total data sample of 712 investments. One observation is per company and not per financing round. **Panel A** shows tranche-specific details, **Panel B** provides round-specific information. PE and VC funds can provide the financing of their portfolio companies not only in a single upfront investment, but rather in several financing rounds, which can be split-up further into several cash injections so called tranches. Several subsets are considered for the analyses of structural differences. Variables are as defined in Table I. Details on the subset classifications by Sector and Stage are provided in Table II.

The IRR is measured on the precisely dated cashflows between the fund and the portfolio company. The investment duration is the period of time measured in years between the initial cash injection from the fund to the portfolio company and the final distribition from the company to the fund. The average duration is defined as the investment duration divided by the number of rounds or tranches during this time. The average round investment is the total investment amount from the fund to the portfolio company divided by the total number of financing rounds during the investment duration.

				Tranches				Rounds					
	Total Investment Duration			Number		Avg. Duration		Number		Avg. Duration		Avg. Investment	
	N	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
All Investments	712	3,98	3,42	3,28	2,00	1,79	1,24	2,18	1,00	2,47	1,89	9916,45	3896,67
Sector Cluster													
Consumer Discretionary	52	4,30	3,89	2,42	2,00	2,67	2,12	1,77	1,00	3,08	2,42	17041,22	10744,65
Financial Services	11	5,71	6,76	2,82	2,00	2,90	3,00	2,83	2,00	2,72	2,38	22821,54	14230,36
HC/LS	117	4,41	3,97	3,83	3,00	1,59	1,17	2,22	1,00	2,75	2,02	6412,14	2702,87
Industrial Production	68	4,46	4,50	2,41	1,50	2,76	2,25	1,75	1,00	3,23	3,05	9702,30	7311,77
IT	180	3,56	3,03	3,19	3,00	1,48	1,08	2,16	1,00	2,21	1,77	7477,21	1726,21
Internet & Media	80	3,64	3,08	3,06	2,00	1,72	1,16	1,99	1,00	2,20	1,55	14998,33	7893,26
Materials	14	5,48	5,99	5,21	3,50	1,53	1,19	4,71	3,50	1,60	1,51	6977,07	2147,87
Services	5	3,81	4,74	2,00	1,00	2,78	2,52	1,80	1,00	2,82	2,52	18667,09	21196,78
Telecommunication	65	2,94	2,28	3,74	3,00	1,07	0,86	2,34	2,00	1,59	1,35	7964,18	3292,51
Others	92	4,39	3,80	3,73	2,00	1,81	1,15	2,42	1,00	2,69	2,14	10887,57	5703,86
Stage Cluster													
early	226	3,74	3,30	3,99	3,00	1,20	0,84	2,69	2,00	1,85	1,28	3821,72	1961,96
Expansion	113	4,53	3,97	3,93	3,00	1,75	1,27	2,33	1,00	2,71	1,78	15097,25	8878,06
Later	132	3,32	2,50	2,18	2,00	1,99	1,47	1,54	1,00	2,53	2,00	16135,14	6819,70
Turnaround	14	3,54	3,13	2,71	2,00	1,83	1,65	1,57	1,00	2,52	2,54	9346,29	5008,92
Age Cluster													
<=1 year	224	4,17	3,71	3,67	3,00	1,68	1,17	2,50	2,00	2,22	1,65	9554,74	3584,59
2 to 5 years	170	3,47	3,08	2,89	2,00	1,63	1,14	2,16	1,00	2,06	1,74	4416,20	1965,50
6 to 20 years	91	4,12	3,29	3,64	2,00	1,75	1,00	2,22	1,00	2,66	1,91	8968,81	4682,98
older than 20 years	36	4,93	4,79	2,28	1,50	3,10	2,73	1,97	1,00	3,44	3,20	36195,28	10814,84
Exit Type Cluster													
IPO	82	3,84	3,17	2,54	2,00	2,02	1,49	1,57	1,00	2,88	2,25	9118,57	2248,18
Sale/Merger	370	4,51	4,03	3,29	2,00	2,10	1,55	2,29	1,00	2,73	2,19	10085,70	4516,41
Write Off	153	1,99	1,57	3,84	3,00	0,47	0,44	2,33	2,00	0,99	0,71	5978,19	2824,33
else/not specified	106	5,10	4,33	2,98	2,00	2,47	1,84	2,05	1,00	3,37	3,00	15742,09	6903,41
IRR Cluster													
IRR<=0	315	3,45	2,67	3,80	3,00	1,15	0,78	2,36	2,00	1,93	1,25	6787,95	2732,17
IRR> 0	381	4,43	3,93	2,79	2,00	2,36	1,75	2,01	1,00	2,93	2,50	12474,76	5678,13

Table 5 Tranche and financing round characteristics by various sub-samples for the i-Phase and p-Phase - in absolute terms

The table presents summary statistics for several phase-specific variables for the total sample of 712 investments. One observation is per company and not per financing round. PE and VC funds can provide the financing of their portfolio companies not only in a single upfront investment, but rather in several financing rounds, which can be split-up further into several cash injections so called tranches. Several subsets are considered for the analyses of structural differences. Variables are as defined in Table I. Details on the subset classifications by Sector and Stage are provided in Table II. We define the total investment relationship period of each investment starting from the initial cash injection from the PE or VC fund to the portfolio company and ending with the final cash distribution from the company to the fund.

We segment the total investment period into three fractional periods of time, each one third of the total period: the first as the initial investment phase, or i-phase; the second as the maturity phase, or m-phase; and the final third as the pre-exit phase, or p-phase. The table shows summary statistics for the following i- phase and p-phase- related staging variables: the number of tranches, the number of rounds and the total investment amount for each phase separately. For illustration: Pp-Amount is the sum of capital injected from the fund into the portfolio company during the p-phase. The last column provides details for the Total Tranche-to-Round-Ratio (TTR). The TTR is the ratio of the number of tranches to the number of financing rounds.

		Tranches				Rounds				Investment Amount					
		i-Phase		p-Phase		i-Phase		p-Phase		i-Phase		p-Phase		TTR	
	N	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
All Investments	712	1.96	1.00	0.57	0.00	1.23	1.00	0.27	0.00	13329.96	4514.39	1338.68	0.00	1.99	1.33
Sector Cluster															
Consumer Discretionary	52	1.38	1.00	0.52	0.00	1.19	1.00	0.27	0.00	20561.46	10744.65	4270.64	0.00	1.60	1.00
Financial Services	12	2.50	2.00	0.33	0.00	1.67	1.00	0.25	0.00	44124.82	14102.68	1196.72	0.00	1.48	1.21
HC/LS	117	2.10	2.00	0.65	0.00	1.15	1.00	0.26	0.00	8301.58	2771.54	481.71	0.00	2.23	1.50
Industrial Production	68	1.75	1.00	0.35	0.00	1.25	1.00	0.12	0.00	11122.75	8453.37	1177.68	0.00	1.78	1.00
IT	180	1.79	1.00	0.66	0.00	1.17	1.00	0.34	0.00	8947.15	2163.49	1357.89	0.00	1.94	1.45
Internet & Media	80	1.89	1.00	0.57	0.00	1.17	1.00	0.16	0.00	20594.11	11275.39	1289.34	0.00	2.01	1.50
Materials	14	2.29	2.00	0.71	0.50	1.64	1.00	0.29	0.00	17933.44	4381.51	1860.35	39.07	1.90	1.17
Services	5	2.00	1.00	0.00	0.00	1.80	1.00	0.00	0.00	18890.40	21196.78	0.00	0.00	1.04	1.00
Telecommunication	65	2.18	2.00	0.51	0.00	1.22	1.00	0.22	0.00	11734.91	3528.15	711.16	0.00	2.22	1.33
Others	92	2.53	2.00	0.53	0.00	1.46	1.00	0.33	0.00	17143.92	5835.00	1054.03	0.00	2.17	1.34
Stage Cluster															
early	226	2.14	2.00	0.83	1.00	1.29	1.00	0.42	0.00	5925.05	2226.23	954.57	1.77	2.14	1.50
Expansion	113	2.41	2.00	0.56	0.00	1.35	1.00	0.19	0.00	22687.74	12445.19	1123.37	0.00	2.25	1.60
Later	132	1.49	1.00	0.35	0.00	1.07	1.00	0.12	0.00	20136.20	6417.86	2057.14	0.00	1.68	1.00
Turnaround	14	1.57	1.00	0.36	0.00	1.21	1.00	0.07	0.00	11065.95	6620.40	321.80	0.00	1.62	1.50
Age Cluster															
<=1 year	224	2.22	2.00	0.59	0.00	1.35	1.00	0.30	0.00	15341.26	5011.69	1027.47	0.00	1.99	1.33
2 to 5 years	170	1.68	1.00	0.55	0.00	1.17	1.00	0.28	0.00	6301.38	2668.36	305.64	0.00	1.77	1.00
6 to 20 years	91	2.05	1.00	0.62	0.00	1.21	1.00	0.29	0.00	11670.34	6018.22	1297.13	0.00	2.07	1.50
older than 20 years	36	1.61	1.00	0.22	0.00	1.36	1.00	0.14	0.00	35006.32	10800.18	6009.90	0.00	1.38	1.00
Exit Type Cluster															
IPO	82	1.76	1.00	0.21	0.00	1.10	1.00	0.17	0.00	10219.73	2751.34	158.21	0.00	1.81	1.00
Sale/Merger	370	2.06	1.00	0.41	0.00	1.32	1.00	0.19	0.00	14676.33	5928.64	1132.06	0.00	1.94	1.14
Write Off	153	1.58	1.00	1.41	1.00	1.01	1.00	0.63	0.00	6773.09	2639.09	2245.64	614.98	2.27	1.50
else/not specified	107	2.30	2.00	0.21	0.00	1.36	1.00	0.10	0.00	20433.53	6663.69	1660.95	0.00	1.91	1.50
IRR Cluster															
IRR<=0	315	1.95	1.00	0.92	1.00	1.18	1.00	0.41	0.00	9097.68	3119.70	1408.38	54.29	2.26	1.50
IRR> 0	382	1.97	1.00	0.25	0.00	1.27	1.00	0.15	0.00	16978.71	5797.86	1249.83	0.00	1.75	1.00

Table 6 Tranche and financing round characteristics by various sub-samples for the i-Phase and p-Phase - in relative terms

The table presents summary statistics for several phase-specific variables for the total sample of 712 investments. One observation is per company and not per financing round. PE and VC funds can provide the financing of their portfolio companies not only in a single upfront investment, but rather in several financing rounds, which can be split-up further into several cash injections so called tranches. Several subsets are considered for the analyses of structural differences. Variables are as defined in Table I. Details on the subset classifications by Sector and Stage are provided in Table II. We define the total investment relationship period of each investment starting from the initial cash injection from the PE or VC fund to the portfolio company and ending with the final cash distribution from the company to the fund.

Columns 2-9 focus on analyses of the i-phase (columns 10-17 focus on the p-Phase) and provide summary statistics (mean and median) for the following staging variables: Tranche-share, Amount-Share, Round-share and the relative tranche-ratio (RTR). The tranche share of one phase is defined as the ratio of the number of tranches during this phase to the total number of tranches during the total investment period. This ratio works analogous for the investment amount and number of financing rounds. The RTR for phase n (n=i, m, p) is calculated as follows: RTRn = PTRn/TTR with PTRn (PhaseTrancheRatio)n = number of tranches in phase n divided by the number of rounds in phase n. The TTR is the ratio of the number of tranches to the number of financing rounds during the total investment period.

		i-Phase								p-Phase							
		Tranche-share		Amount-share		Round-share		RTR		Tranche-share		Amount-share		Round-share		RTR	
	N	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
All Investments	712	0.73	0.75	0.83	0.96	0.73	1.00	1.13	1.00	0.14	0.00	0.07	0.00	0.11	0.00	0.47	0.00
Sector Cluster																	
Consumer Discretionary	52	0.76	1.00	0.89	1.00	0.79	1.00	0.93	1.00	0.13	0.00	0.04	0.00	0.11	0.00	0.39	0.00
Financial Services	12	0.79	1.00	0.90	1.00	0.78	1.00	1.05	1.00	0.12	0.00	0.05	0.00	0.12	0.00	0.29	0.00
HC/LS	117	0.70	0.67	0.82	0.91	0.70	1.00	1.17	1.00	0.11	0.00	0.05	0.00	0.09	0.00	0.46	0.00
Industrial Production	68	0.84	1.00	0.92	1.00	0.86	1.00	1.01	1.00	0.09	0.00	0.04	0.00	0.05	0.00	0.33	0.00
IT	180	0.66	0.60	0.80	0.89	0.68	1.00	1.15	1.00	0.19	0.00	0.09	0.00	0.14	0.00	0.58	0.00
Internet & Media	80	0.75	0.78	0.79	0.98	0.78	1.00	1.12	1.00	0.14	0.00	0.09	0.00	0.08	0.00	0.50	0.00
Materials	14	0.54	0.46	0.69	0.70	0.54	0.50	1.22	1.00	0.13	0.04	0.06	0.01	0.04	0.00	0.64	0.27
Services	5	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Telecommunication	65	0.69	0.67	0.78	0.87	0.69	0.75	1.16	1.00	0.13	0.00	0.09	0.00	0.09	0.00	0.50	0.00
Others	92	0.79	1.00	0.87	1.00	0.79	1.00	1.14	1.00	0.11	0.00	0.05	0.00	0.11	0.00	0.36	0.00
Stage Cluster																	
early	226	0.63	0.57	0.74	0.79	0.66	0.67	1.13	1.00	0.18	0.09	0.11	0.00	0.15	0.00	0.60	0.21
Expansion	113	0.72	0.80	0.84	0.98	0.74	1.00	1.11	1.00	0.11	0.00	0.06	0.00	0.09	0.00	0.43	0.00
Later	132	0.81	1.00	0.91	1.00	0.84	1.00	1.09	1.00	0.10	0.00	0.05	0.00	0.05	0.00	0.38	0.00
Turnaround	14	0.77	1.00	0.92	1.00	0.89	1.00	0.89	1.00	0.07	0.00	0.01	0.00	0.04	0.00	0.31	0.00
Age Cluster																	
<=1 year	224	0.72	0.75	0.79	0.89	0.71	1.00	1.11	1.00	0.12	0.00	0.08	0.00	0.11	0.00	0.44	0.00
2 to 5 years	170	0.72	0.73	0.84	0.98	0.73	1.00	1.08	1.00	0.16	0.00	0.07	0.00	0.11	0.00	0.48	0.00
6 to 20 years	91	0.71	0.75	0.84	0.96	0.72	1.00	1.16	1.00	0.13	0.00	0.06	0.00	0.11	0.00	0.45	0.00
older than 20 years	36	0.85	1.00	0.92	1.00	0.81	1.00	1.11	1.00	0.07	0.00	0.04	0.00	0.09	0.00	0.30	0.00
Exit Type Cluster																	
IPO	82	0.78	1.00	0.88	1.00	0.75	1.00	1.26	1.00	0.08	0.00	0.04	0.00	0.09	0.00	0.29	0.00
Sale/Merger	370	0.76	1.00	0.87	1.00	0.76	1.00	1.13	1.00	0.09	0.00	0.04	0.00	0.08	0.00	0.36	0.00
Write Off	153	0.52	0.50	0.67	0.69	0.61	0.50	1.01	1.00	0.32	0.33	0.20	0.16	0.25	0.00	1.04	1.00
else/not specified	107	0.86	1.00	0.89	1.00	0.80	1.00	1.18	1.00	0.08	0.00	0.01	0.00	0.03	0.00	0.17	0.00
IRR Cluster																	
IRR<=0	315	0.62	0.50	0.76	0.84	0.67	1.00	1.07	1.00	0.20	0.17	0.12	0.01	0.17	0.00	0.70	0.40
IRR> 0	382	0.82	1.00	0.89	1.00	0.78	1.00	1.19	1.00	0.07	0.00	0.03	0.00	0.06	0.00	0.24	0.00

Table 7 Regression on the determinants of the return on PE and VC investments – Phase Approach

The sample is 712 Investments (one observation is per company, not per investment round) during the period from January 1979 till November 2003 merged from the Venture Economics and Cepres databases. The dependent variable is the logarithm of (IRR+1.1). The IRR is measured based on the precise cashflows between the fund and the portfolio company. The different regression models are grouped by four categories (see row one). PE and VC funds can provide the financing of their portfolio companies not only in a single upfront investment, but rather in several financing rounds, which can be split-up further into several cash injections, so called tranches. We define the total investment relationship period of each investment starting from the initial cash injection from the PE or VC fund to the portfolio company and ending with the final cash distribution from the company to the fund.

We segment the total investment period into three fractional periods of time, each one third of the total period: the first as the initial investment phase, or i-phase; the second as the maturity phase, or m-phase; and the final third as the pre-exit phase, or p-phase. Models (1) and (2) focus on the i-phase, models (3) and (4) on the m-phase, models (5) and (6) on the p-phase. Model (7) combines independent variables from both phases. The first column defines the categories of the independent variables, the second column presents the variables. Independent vairables include besides Investment Manger-, Fund-, Company- and market-specific variables, also variables concerning the staging behaviour within each phase. Variables are as defined in table I.

The last three rows present the model diagnostics (R square, Adjusted R square and the F- statistic). The coefficients (only) of the OLS regression are illustrated in the third to ninth column. *, **, *** Significant at the 10%, 5%, 1% levels, respectively.

		Dependent Variable: Logarithm of (IRR+1.1)						
		i- Phase		m-Phase		p- Phase		Mixed
Independent variables		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Constant	-0.737***	-0.764***	-0.013	-0.155	0.090	0.008	0.052
Investment Phases	TTR	-0.012	0.015	-0.036***	-0.020	-0.023**	-0.014	0.001
	Pi Tranche-share		0627***					
	Pm Tranche-share				-0.138			
	Pp Tranche-share						-0.507***	
	Pi Amount-share	0.665***						
	Pm Amount-share			-0.409***				
	Pp Amount-share					-1.095***		
	Pi Round-share	0.139**	0.141*					
	Pm Round-share			0.127	0.009			
	Pp Round-share					-0.438***	-0.501***	
	Pi RTR							-0.033
	Pm RTR							-0.063*
	Pp RTR							-0.314***
IM	IM Age		-0.002		-0.002		-0.002	-0.002
	Fund Sequence	0.017***		0.021***		0.017***		
	US-IM	0.038	0.050	0.056	0.067	2.25E-04	0.007	-0.026
Fund	VC-Fund	0.083		0.014		0.036		
	Fundsize	-2.29E-11	1.23E-11	-2.81E-11	-4.79E-12	-3.66E-11**	-6.10E-12	3.87E-12
Investment	No.of IM	-0.002	-7.32E-04	- 0.003	-0.002	-0.004	-0.003	-6.96E-04
	IPO	0.423***	0.363***	0.455***	0.406***	0.419***	0.350***	0.316***
	Age of Company		-1.53E-04		-9.51E-04		-7.97E-04	-1.90E-04
	High Tech		0.175***		0.130**		0.136**	0.150***
	Later Stage		0.132**		0.208***		0.159***	0.146***
	Use of Convertibles	0.243***	0.231***	0.269***	0.264***	0.211***	0.201***	0.213***
Market	No. Of IPOs	-5.17E-04**	-3.81E-04	-5.24E-04**	-2.96E-04	-2.56E-04	-1.26E-04	-2.40E-04
	Comitted Capital	-1.43E-06***	-1.48E-06***	-1.29E-06***	-1.22E-06***	-1.24E-06***	-1.38E-06***	-1.16E-06***
Model Diagnostics	Rsquare	0.267	0.284	0.193	0.182	0.321	0.286	0.308
	Adjusted Rsquare	0.254	0.263	0.179	0.158	0.309	0.265	0.287
	F - Statistic	20.652***	13.522***	13.610***	7.598***	26.769***	13.673***	14.096***