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PERFORMANCE DIFFERENTIATION: CUTTING LOSSES AND MAXIMIZING PROFITS OF PRIVATE EQUITY AND VENTURE CAPITAL INVESTMENTS

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Abstract.

The necessity to differentiate between good versus poor performance of venture capital and private equity investments regarding the allocation of cash flow rights and control rights is confirmed by KAPLAN/STRÖMBERG (2003). Therefore, a specific analysis of the determinants of 'winners' and 'losers' of a fund is needed and yet has so far not been performed by previous empirical research. This study is the first to examine different contractual and behavioral characteristics and their influence on the positive and negative performance of private equity investments. Specifically, we analyze how fund managers apply tools and investment behavior to mitigate risks and maximize returns The empirical investigation of these issues is based on a merged dataset, which combines the Venture Economics and CEPRES databases and in total comprises 1,011 investments made by 137 different funds belonging to 54 private equity and venture capital firms worldwide between 1979 and 2003. We use the Internal Rate of Return as a measure for performance, which we have calculated on the basis of precise cash flows between the fund and the portfolio company. We split the sample to differentiate between 'winning' and 'losing' investments in the empirical analyses. Our results confirm that different factors influence the reduction of losses versus the maximization of investment proceeds. Moreover, losses are specifically minimized by the use of convertibles and by increasing venture capital firms' experience. Furthermore, increasing fund managements' resource allocation to companies maximizes profits. Our findings contribute to the understanding of the determinants of venture capital and private equity returns by differentiating between the mitigation of risks and the maximization of profits.

Performance differentiation: Cutting losses and maximizing profits of private equity and venture capital investments

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1 Introduction

Understanding the determinants of the development and performance of firms financed by private equity and venture capital is an important research issue (e.g. BANTEL (1998); BIRLEY/WESTHEAD (1990); BOWDEN (1994); DILLER/KASERER (2004); HEGE/PALOMINO/SCHWIENBACHER (2003); MACMILLAN/KULOW/KHOYLIAN (1989)). Prior research has mainly focused on understanding the factors that lead to entrepreneurial firms' superior performance and, specifically, analyzed the financial investor's value added (e.g. HELLMANN/PURI (2002); SAPIENZA (1992); SAPIENZA/MANIGART/VERMEIR (1996)). A few studies have, however, also examined entrepreneurial firms' 'negative performance'. AZOULAY/SHANE (2001) and DUCHESNEAU/GARTNER (1990), for example, focused on the failure of entrepreneurial firms. ODEAN (1998) analyzed investors' reluctance to realize losses, while GUNTHER MCGRATH (1999) emphasized entrepreneurial failure's role in wealth creation. These studies recognize the importance of not only understanding factors that contribute to superior performance, but also determining factors that influence inferior performance. KAPLAN/STRÖMBERG (2003) strongly emphasize the importance of a differentiated analysis in regards to good performing versus bad performing projects.

Understanding not only the factors that maximize single investments' return but also those that minimize investments' financial losses research question is also relevant from an investor's point of view for several reasons. First, instead of simply increasing return perspectives by investing in riskier assets, fund managers can apply a range of tools and behavioral characteristics to specifically actively influence risk reduction and an increase in profits. Gaining a detailed understanding of the particular factors that impact losses and profits can help fund managers to optimize investment patterns. Second, it can also enable investors to improve their choice of fund managers by focusing on these factors during a due diligence.

However, despite the fact that the relevance of financial loss reduction is widely acknowledged by researchers and industry experts alike, as far as we have been able to ascertain, previous studies did not examine the antecedents of loss reduction in firms financed by private equity and venture capital. Consequently, we pose the following research questions: What are the antecedents of cutting losses in venture capital investments in portfolio companies? Do the factors that contribute to the minimization of financial losses differ from the factors that contribute to the maximization of financial returns?

Previous studies have identified macroeconomic, behavioral and contractual variables that influence private equity investments' returns, e.g. the legal and market environment, the venture capital or private equity fund's (VCF) age and reputation, as well as the investment's characteristics and structure. We build on these previous findings by deriving hypotheses that link the effects of the VCF's experience, the ratio of portfolio companies (PFC) to investment managers, the use of convertibles, the number of early rounds, and the staging intensity in the pre-exit phase to both positive and negative internal rates of return.

We test our hypotheses using a unique dataset derived from the merger of both Venture Economics and CEPRES' comprehensive databases which contains 1011 private equity (PE) and venture capital (VC) funds' investments spanning 25 years and 39 countries. The dataset comprises precise information regarding cash flows between the funds and the portfolio companies, thus enabling an accurate calculation of the internal rate of return (IRR) as a dependent variable. To compare the various factors' different influences, we performed regression analyses with identical predictors on both the 'winners' (sub-sample with IRR >= 0%) and 'losers' (IRR < 0%).

Our results show that only two factors are associated with both an increase in a positive IRR and a decrease in a negative IRR, namely the number of early rounds and the staging intensity in the pre-exit phase. In addition, VCF's experience significantly reduced losses but did not increase returns and a small ratio of PFC to investment managers significantly increased returns but did not reduce losses.

The use of convertibles significantly reduced losses, but was also negatively associated with returns. The intensity of staging in the pre-exit phase was also negatively associated with returns.

The reminder of the paper is organized as follows. The next section reviews the literature and develops hypotheses regarding the relationship between structural, behavioral and contractual variables and financial gains and losses. Following the data and methodology section, we present the empirical results. The final section concludes with a discussion and suggestions for future research.

2 Hypotheses Development

Our study focuses on the detailed empirical analysis of the determinants of VC and PE investment returns with a special emphasis on investments with both positive and negative returns. In their study, KAPLAN/STRÖMBERG (2003) discuss the importance of distinguishing between the analyses of performance determinants depending on the venture's development. They find that "…cash flow rights and control rights can be separated and made contingent on observable and verifiable measures of performance" (p. 282). Their empirical findings are in line with the theory that, depending on the success of the company, control shifts to investors, as argued by AGHION/BOLTON (1992) as well as by DEWATRIPONT/TIROLE (1994). In a further study, KAPLAN/STRÖMBERG (2004) underline the importance of a performance-sensitive allocation of financing characteristics, contracts and actions by the investor. The results of the aforementioned studies suggest that empirical analyses should be performed that differentiate between 'winners' and 'losers' in private equity funds. So far, several studies have focused on the determinants of venture capital and private equity performance, however without separate analyses for the antecedents of good versus bad performing projects. For example, CUMMING/WALZ (2004) concentrate on market and legal factors' influence as well as the influence of VC funds, entrepreneurial firms and investments' characteristics on the returns of unrealized, partially realized and fully realized investments. But they do not differentiate between the analyses in respect of winners and losers. Neither is this differentiation provided by HEGE ET AL. (2003), who show that investments in the mature US market generate higher returns compared to those in the relatively new European market. Our study thus contributes to the literature by, for the first time, providing detailed empirical analyses of VC and PE returns' determinants, and differentiating with respect to positive and negative performance.

2.1 Investor Experience

GOTTSCHALG/PHALIPPOU/ZOLLO (2003) analyze a broad sample of private equity and venture capital funds ranging from 1980 to 2002 with regard to investment returns' determinants. They find that investment managers who outperform their peers are often more experienced and manage larger funds. Thus, it is plausible to assume that with each additional investment manager who joins the fund management team, the accumulated experience of the fund increases. We therefore regard the funds' number of general partners as a proxy for investment experience. By considering fund size in committed capital as a proxy for experience, other studies confirm the positive impact of investor experience on performance, for example, LJUNGQUIST/RICHARDSON (2003) by analyzing data of private equity funds raised between 1981 and 2001 as well as KAPLAN/SCHOAR (2005) by investigating 746 funds from the Venture Economics database. SAPIENZA ET AL. (1996) conclude that more experienced funds can support their portfolio companies better, thereby adding more value and generating higher returns. Previous studies confirm the positive influence of investor experience on performance, implying both aspects: minimizing losses as well as enhancing profits. Building on this research, we propose that:

Hypothesis 1a: Investor experience has a positive impact on reducing losses.
Hypothesis 1b: Investor experience has a positive influence on maximizing profits.

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2.2 Fund Managers' Resource Allocation on the Portfolio Company

While several studies have focused on fund managers' involvement in and resource transfer to portfolio companies, none have specifically differentiated between poorly performing investments and successful deals. MACMILLAN ET AL. (1989) find that added value is realized by fund managers' involvement in their investments. KANNIAINEN/KEUSCHNIGG (2003) confirm that VC fund managers do not only finance but also add value to their portfolio companies. They point out that advising portfolio companies is time consuming and creates a trade-off between intensity of advice and portfolio size. They determine an optimal number of portfolio companies with regards to the intensity of managerial advice. We conclude that the involvement of the fund's investment manager can be regarded as a limited resource that has to be divided among all the portfolio companies under his supervision. We therefore regard the ratio of the fund's number of investment managers to the fund's number of portfolio companies as a proxy for the funds' management resource allocation. Further studies suggesting the positive impact of investment managers' involvement with a portfolio company include BRANDER/AMIT/ANTWEILER (2002), who offer a theory on and empirical evidence of investors who provide added value and complement their resources by syndicating their investments; MANIGART ET AL (2002), who show that investment managers increase the probability of success by offering their portfolio companies advice and specialized capabilities, and HELLMANN/PURI (2002), who find that fund managers help to professionalize start-up companies by implementing a more professional recruitment strategy. On the one hand, it is obvious that a more intense cooperation between the portfolio company and the fund manager can help reduce the investment risk, and is therefore associated with fewer losses. On the other hand, more support and added value will help to further maximize an investment's profit perspectives. Consequently, this comprehensive set of studies leads us to the following predictions:

Hypothesis 2a: Fund managers' resource allocation has a positive impact on reducing losses.
Hypothesis 2b: Fund managers' resource allocation has a positive influence on maximizing profits.

2.3 Convertible Securities

Convertible securities have been recognized by several previous studies as an important instrument to mitigate investment risks (e.g. WILKENS/RÖDER (2003)). Using the most common convertible security, convertible debt, VC and PE funds enjoy the risk protection of being priority lenders and the option to convert debt into equity to participate almost as profitably as traditional equity investors in successful cases. Although it is common knowledge that convertibles are mainly relevant in respect of minimizing downside risks, previous empirical studies have not focused on datasets, which include both winners and losers. For a specific look at the impact of convertibles' use on investment risks as well as on returns, it is key to categorize the data in the data set and to perform specific analyses in respect of the non-performing as well as the successful deals. The following authors have confirmed the benefit of using convertible securities to mitigate PE and VC investment risks: CORNELLI/YOSHA (2003) argue that the use of convertibles reduces the entrepreneur's incentive to window-dress and his tendency towards short-termism; REPULLO/SUAREZ (2004) conclude that the use of convertibles helps to align the investor and entrepreneur's interests and is especially applicable in respect of riskier projects, while CASAMATTA (2003) argues that convertible bonds are primarily used when entrepreneurs have to be given strong incentives, which is of special importance if projects perform poorly. Based on these previous studies, we derive the following hypothesis.

Hypothesis 3: The use of convertible securities has a positive impact on reducing losses.

2.4 Staging in the Initial Investment Phase

Private equity and venture capital funds often provide their portfolio companies with step-wise or staged capital allocations instead of a single up-front investment. NEHER (1999) develops a model explaining that staging can help to overcome entrepreneurs' hold-up or commitment problems. GOMPERS (1995) provides evidence that staging is primarily applied when informational asymmetries between the fund and the portfolio company are highest, which is typically the case at the beginning of an investment relationship. CALANOG/KROHMER/LAUTERBACH (2006) find that staging has a positive impact on performance at the beginning of an investment relationship. They introduce the initial investment phase as the first of three phases by dividing a fund's total investment period in a company into three parts, thus obtaining three sub-periods of equal duration. However, none of these previous studies has specifically differentiated their analyses between the impact of staging on non-performing and on successful investments. SAHLMAN (1990) argued that the use of staging mitigates information asymmetries and agency problems, which may be especially present in non-performing investments. Therefore, we propose that staging during the initial investment phase has a positive influence on poor-performing companies' returns, in other words it helps to reduce losses. In our study, we measured staging - the number of financing rounds during the initial investment phase - as the ratio of the company's total number of financing rounds by the fund to the total investment period. GOMPERS (1995) finds that, "firms that go public (these firms yield the highest return for [VCs] on average) receive more total financing and a greater number of rounds than other firms (those that go bankrupt or are acquired)." Since GOMPERS (1995) concludes that more financing and a greater number of rounds lead to higher returns, we also specifically analyze whether staging helps to reduce losses as well as maximize profits and present the following hypotheses.

Hypothesis 4a: Staging during the initial investment phase has a positive impact on reducing losses.
Hypothesis 4b: Staging during the initial phase has a positive impact on maximizing profits.

2.5 Staging in the Pre-Exit Phase

Several studies on staging, (e.g. GOMPERS (1995); SAHLMAN (1990); WANG/ZHOU (2004)) have argued that the fund's option to abandon a project, whose prospects seem dim, is an inherent value of staged financing. The abortion of a non-performing project typically occurs at the end of the investment period, which is the final third of the entire period and pre-exit phase (CALANOG ET AL. (2006)). CALANOG ET AL. (2006) analyze non-performing projects and find that investors do not rigorously terminate losers. KAHNEMANN/TVERSKY'S (1979) prospect theory offers an explanation for this behavior. The decision whether to abandon a project or to "throw good money after bad" is often influenced by the fear of 'guaranteed' losses. Unwillingness to terminate non-performing projects is in line with arguments put forward by ARKES/BLUMER (1985) as well as by BROCKNER (1992), who investigate the escalating commitment of decision makers who are unwilling to admit that their allocation of resources has been wrong (also called the self-justification theory). KAHL (2002) points out that creditors, in our case investors, often lack the information that is needed to make a quick and correct liquidation decision. BOOT (1992) argues that fund managers often 'hang on to losers'. He analyses the divestment decisions of managers who care about their reputation and came to the conclusion that reputational concerns tend to make managers reluctant to divest, despite negative signals having been observed, because these managers' abilities are linked to their ventures' success. Since, for example, fund raising depends heavily on investors' assumption regarding the fund management's ability, all VC or PE fund managers are consequently concerned about their reputation. These theories are consistent with findings by HEGE ET AL. (2003), who observe that the total number of financing rounds that a portfolio company receives is negatively associated with returns.

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CALANOG ET AL. (2006) interpret frequent staging during the pre-exit phase as a desperate attempt to turn an unsuccessful portfolio company around. These studies bring us to the following hypothesis:

Hypothesis 5a: Staging during the pre-exit phase is associated with critical situations and therefore with greater losses.

3 Data and Methodology

3.1 Limitations of Previous Studies

Our study's level of detail and accuracy exceeds that of previous empirical studies focusing on the determinants that influence VC and PE performance. GOMPERS (1995) used a proxy for measuring performance by classifying the exit type and counting IPO as success. We consider this measurement approach as imprecise as, for example, a highly valued trade sale can provide a higher return on investment than a poorly performing IPO. HEGE ET AL. (2003) base their performance measurement firstly on a questionnaire dataset and, secondly, on valuations based on Venture Economics data. They use the same proxy for measuring performance as used by GOMPERS (1995) in respect of the questionnaire data set, which is, again, vague. Based on the Venture Economics data, they measure performance as the project's internal rate of return (IRR) between the first financing round and the project's last self-reported valuation to quantify the impact of VCs' behavior on their project's profitability. Their IRR measurement is focused on the company's development and not exactly on the specific investment's return, which can only be measured on a cash flow basis.

Furthermore, the IRR figures in the study by HEGE ET AL. (2003) lack precision and correctness due to their measurement approach's following two inherent weaknesses: Firstly, IRR measurements based on Venture Economics data alone can lead to bias, which can materially affect researchers' estimates of returns and valuation patterns over time. The logic behind this aspect is that the IRR is only meaningful when calculated on the investment's exact date, but Venture Economics only provides dates of financing rounds, not the exact date of the cash injection, which can differ from the round date due to the tranching of rounds into several cash injections. The latter is also known as milestone financing. The same aspect applies to the exit date provided by Venture Economics, which is not always equivalent to the precise date of the return cash flow to the investor. Secondly, HEGE ET AL. (2003) use valuation data instead of cash flows for their performance measurement, and their IRR measurement is partially based on estimates regarding the first stage valuation of those cases in the data set with missing information. Although Venture Economics therefore provides a very comprehensive pool of data with vast information on each financing round, the precise measurement of performance's determinants is not possible with this data alone, due to the above-mentioned problems.

3.2 Sample and Data Collection

Instead of relying on self-reported data as, for example, KAPLAN/STRÖMBERG (2004), or HEGE ET AL. (2003) did, we aim to overcome some of the aforementioned limitations of previous studies by basing our study on a merged data set from Venture Economics data and CEPRES data. A detailed description of the reliability and validity of this dataset are provided by CALANOG ET AL. (2006). While the Venture Economics data is based on detailed information about each financing round, all the related characteristics as well as valuations provided by the VC and PE fund, CEPRES data are based on partially audited information monitored by independent third parties for annual reporting or due diligence purposes. Furthermore, CEPRES data provides specifications regarding the exact cash flows of each financing round's specific tranch. We increase the validity of our analyses by merging two databases, namely the self-reported Venture Economics data with the CEPRES data. At the time of the merger of the two databases in November 2003, CEPRES contained 5.308 investments in

4.476 portfolio companies provided by 229 funds belonging to 74 fund management firms. The data obtained from Venture Economics included 178.300 financing rounds. To ensure validity in the merging of the databases, the entries of the two datasets were matched on four different levels: First the names of the fund management firm, second the names of the fund, third the name of the portfolio company and fourth the date of the initial investment from the fund into the portfolio company. The matching resulted in 1.774 investments with corresponding entries on all four levels in both databases. To prevent any reporting biases that are potentially inherent in unrealized investments, the dataset was reduced to only fully and partially realized investments. After this merger and reduction process, the database consisted of 1.011 investments by 137 private equity and venture capital funds belonging to 54 fund management firms. These investments include 3.299 cash injections (tranches) and 1.950 financing rounds during the period from January 1979 until November 2003. As shown by CALANOG ET AL. (2006), the sample is representative in regards to frequency distributions of investments and exits as well as in regards to regional, industry, development stage and performance characteristics.

Table 1 provides an overview of the frequency of regional, stage, industry and performance characteristics within the total data set and both sub samples. Out of our data sample, 59,5% of the investments occurred in the USA. With respect to the remaining 40,5%, the majority of companies invested in were located in the UK (110 investments, 10,9%), followed by France (43 investments, 4,3%). In regards to development stages, 27,5% of the total number of investments were early stage investments, 18,6% of the companies were financed during the expansion phase (expansion and acquisition financing), and 21,5% are categorized as later stage investments, including MBO/MBI, LBO, public to private and Mezzanine. The remaining percentages could not be clearly classified. While more than 50% of the observed companies offered products classified as high technology, the percentage of classic industries like, e.g., manufacturing, construction or retail, is 14,3%.

The entire data set's mean IRR on investment is 62,2% p.a. Since we focus our analysis on those companies that offer the potential to reduce losses, we split the entire data set into two separate datasets – one containing all investments with an IRR on investment below 0% p. a. and one comprising investments with an IRR of at least zero percent. The first and more relevant data set for our study regarding the number of observations contains 384 investments out of a total of 1.011 investments. The mean IRR on investment within this sample is -66,15% p.a. Accounting for 60,2% of these investments, the number of US-American companies does not differ considerably in this sample when compared to the dataset as a whole. The same cannot be said for British and French companies, which represent 6,0% and 3,4% of all "losers". The differences are even more significant with respect to the stages. The share of early stage investments is 42,4%; expansion financing represents 13,3%, and later stage financing 15,4% of the sample with negative IRRs. Since early stage and high technology investments are riskier, their more frequent occurrence in this data set is as plausible as the higher percentage of high tech companies (59,6%). Due to the necessity to differentiate between those factors that reduce losses and those that maximize performance, a closer look at the "winners" sub sample is also vital. 627 investments out of 1.011 show an IRR performance of at least 0% p. a.; 57,7% of these investments occurred in the USA, 13,4% in the UK, and 4,6% in France. As expected, the percentage of early stage investments is not as high as in the sub sample of companies with an IRR below 0%. Early stage investments account for 17,9% of the "winners" sample, expansion financing for 21,4% and later stages for 24,6%. In regards to the frequency distribution of the industries in the "winner" sample, 44,5% of all investments are in high tech companies, while the percentage of classic industry is 16,4%. The 627 investments' mean IRR is 143,0% p. a.

Insert Table 1 about here

4 Empirical Results

4.1 Descriptive Results

Since there is very little data on funds' losses, we find it interesting and useful to also report a few basic results regarding the firm and fund characteristics in our sample and their returns and losses. The following will therefore focus on: i) the venture capital funds' cash flows to the portfolio firms, and ii) the characteristics of the variables used in our hypotheses.

We use the detailed information on cash injections in order to measure the impact of several variables on investments' performance. In contrast to GOMPERS (1995), who had to rely on proxies for performance measurement, our data set allows for the calculation of an investment's IRR on the basis of information regarding each financing round (as provided by Venture Economics), as well as regarding each cash transaction or tranche (as provided by CEPRES), which leads to a high level of preciseness. HEGE ET AL. (2003), who produced one of the more current papers on the issue of factors influencing performance, nonetheless based their performance on Venture Economics data alone, although this data not only lacks information on the cash injection's exact date, but is also partially based on self-reported valuations only.

In order to make the most of the preciseness of our data set, we choose log(IRR+1,1) as the dependent variable. The advantage of this variable is that the logarithm adjusts for the asymmetric distribution of raw returns. Furthermore, using IRR+1,1 is essential, since we thus include all negative and positive returns and even total write-offs, i.e. IRR= -100% = -1 in our study. Details on the distribution of log(IRR+1,1) in our three samples (total dataset, IRR<0 and IRR >=0) are provided in Table 2. The analysis shows for example, that high tech investments not only offer higher potential returns, they are also the most risky investments.

Insert Table 2 about here

The number of general partners - the independent variable in Hypothesis 1 – is set into relationship with the distribution of performance. Although the regional and industry analyses suggest that a higher number of general partners is associated with negative returns, the exit analysis shows that the number of general partners is higher in those exits that perform better.

Insert Table 3 about here

To test whether or not a more intense cooperation between the portfolio company and the investment manager could contribute to reducing losses, we analyze the independent variable, which allows us to measure the resource allocation. This dummy variable can either be one if the number of portfolio companies per investment manager is below 1,5, or zero if the number is above 1,5. Consequently, if there is a higher occurrence of investment managers responsible for less than 1,5 companies in one of the sub-samples, this might indicate that closer cooperation influences performance. Regardless of the region, the stage or the industry of the investment, Table 4 shows that the number of portfolio companies per investment manager is more often below 1,5 in the sub-sample IRR >= 0 than in the sub-sample of "losers". This is a strong indicator of a relationship between performance and intensity of cooperation as formulated in Hypothesis 2.

Insert Table 4 about here

Hypothesis 3 requires an analysis of convertible securities' impact on the IRR of investments performing poorly. We therefore created a dummy variable, which is equal to one if convertible securities are used and to zero if not. The descriptive statistics show that convertibles appear to improve the possibility of ending up in the black. Whereas 39,00% of all investments in the USA with a positive IRR were financed by convertibles, only 14,70% of the investments with a negative IRR utilized convertible securities. Our hypothesis receives further statistical support when we examined the total write-offs. None of the projects that were written off completely used convertibles. One explanation could be that convertibles can help to avoid total write-offs. An alternative explanation could be that the companies with the highest risks have not sufficient tangible assets to obtain convertible securities from investors. Additionally, convertibles appear to be an appropriate financial instrument to finance early stage and expansion companies. Of the latter two types of companies, 17,90% and 51,50% of those with investments with a positive IRR applied convertibles, whereas only 1,20% and 21,60% of the "losers" were financed by convertibles.

Insert Table 5 about here

The last two independent variables that were tested in respect of their influence on performance are: i-phase staging intensity is measured by the share of financing rounds during the initial investment phase divided by all rounds the company received by the fund. p-phase staging intensity is measured as the ratio of the company's number of financing tranches by the fund during the pre-exit phase to the total number of financing tranches the company received from the fund during the total investment period. A tranch is regarded as a fraction of a financing round, which CUNY/TALMOR (2003) regard as milestone financing. Hypothesis 4 predicts that more intense staging during the start-up phase mitigates the risk of high sunk costs and thereby reduces losses. The descriptive statistics of Hypothesis 4's variable support this proposal. The mean share of early stage investments' phase one rounds with an IRR of above zero is 72,19%, whereas companies with an IRR below zero receive 63,73% of their financing during the start-up phase. Due to this spread between successful and unsuccessful companies, phase one financing appears to be positively related to performance. Further proof is provided by, for example, examining the IPOs. Those with a positive IRR received 79,17% of all financing rounds during the start-up phase. The IPOs with a negative performance are noticeable lower with 65,21%.

The opposite should hold true for the staging intensity during phase three. Hypothesis 5 maintains that intense staging during this phase is associated with critical and risky developments in respect of an investment. An increase in tranches in phase three is therefore an indicator of higher losses. In the USA, for instance, the mean of the staging intensity of all observations during the p-phase is five times higher for "losers" than for investments with positive IRRs. The same applies to the high technology sector where the mean is more than three times higher for "losers". These observations clearly show that a relative high number of tranches during the pre-exit phase is only necessary if the company still faces significant risks. Finally, further proof of our proposal is provided by the highest staging intensity by far being observed during the pre exit phase in the sub-sample of all write-offs.

Insert Tables 6 and 7 about here

4.2 Regression Results

The following section reports the results of the hypotheses tests. Table 8 gives a description of all variables used in the regression models and Table 9 reports the results of the regression analyses.

Insert Tables 8 and 9 about here

Predictions on the influence of the investor experience

The results confirm Hypothesis 1a by showing that according to regression model one in Table 9, a more experienced VC firm has a positive influence on reducing the losses of poorly performing portfolio companies. Surprisingly, the results do not confirm Hypothesis 1b, and show that a VC firm's greater experience does not necessarily enhance the profits of investments that perform well. These findings are in line with ZAHRA/NEUBAUM/EL-HAGRASSEY'S (2002) contention that the key value drivers no longer provide support once a project reaches a certain stage. In other words, the fund managers' experience no longer matters, but the entrepreneurs' products and their competitive advantage do. SAPIENZA ET AL. (1996) argue that investment managers add relatively more value when uncertainty was high', which clearly supports our reducing losses hypothesis and not the profit maximization one.

Predictions regarding the impact of the funds' management resource allocation on the portfolio company

The results in respect of the entire data sample strongly confirm that a greater allocation of funds' management resources increases the return on investment conforming Hypothesis 2a. These findings are in line with the CUMMING/WALZ'S (2004) results that found that more monitoring and advice contribute to a significant increase in the IRR. On a differentiated basis, we find that this impact is only significant for profit maximization and not for reducing losses thus rejecting Hypothesis 2b. These findings contradict GOMPERS/LERNER'S (2001) proposal as they argue that intense cooperation, which we consider as another form of resource allocation, is primarily beneficial in early stages and during critical or high risk phases. From a econometric perspective it is possible that no or low significance within each of the sub-samples can still allow a high significance of the total sample due to the distribution of the sub-sample clusters in an overall analysis.

Predictions regarding the impact of convertible securities' use on the investment return

The regression results strongly confirm convertible securities' positive impact on reducing losses confirming Hypothesis 3. It has to be considered, that companies with sufficient tangible assets generally obtain convertibles and therefore usually not the projects with the highest risks, for example, seed stage companies. The use of convertibles can help to limit the sunk cost in critical situations by giving fund managers the option to force bankruptcy and obtain liquidation preference over equity, although this option does not necessarily help to maximize profits. Compared to pure equity financing, convertibles generate a lower payoff in respect of the best-performing investments. This 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 disproportionately to the positive effect in respect of reducing losses, which leads to convertibles' overall negative effect on investment returns. This result contradicts the findings in CUMMING/WALZ'S (2004) study, which finds that convertibles have a positive impact on the IRR in a sample that includes both winners and losers. They argue that, amongst others, convertible securities contribute to a significant increase in realized returns. When examining winners and losers in a differentiated sample, this reveals the specific influence that financing instruments like convertibles has. If a total sample contains a high proportion of either winners or losers, an analysis of just the total sample can lead to misinterpretations.

Predictions regarding the impact of staging during the initial investment phase

Our results confirm that an increase in financing rounds during the initial investment phase has a strongly positive impact on performance in respect of both the winners and the losers confirming

Hypotheses 4a and 4band, consequently, in respect of the total sample. This finding is in line with the evidence provided by GOMPERS (1995) and the argument by SAHLMAN (1990) that staging is most valuable to mitigate information asymmetries and agency problems. The information asymmetries between the fund manager and the entrepreneur are, of course, the highest at the beginning of an investment relationship, regardless of the investment's eventual outcome. The results indicate that staging's positive impact is stronger in respect of cutting losses than in respect of maximizing profits.

Predictions regarding the impact of staging during the pre-exit phase
More intense staging during the pre-exit phase is associated with more critical situations in respect of both non-performing deals and those performing well. The findings confirm Hypothesis 5. This is due to deals with less staging during the pre-exit phase generally being those investments performing at or above plan. However, when companies develop below plan - irrespective of whether they generate a positive or negative IRR - a situation with relatively more information asymmetries emerges, causing a relatively higher demand for staging. This finding is in line with BERGEMANN/HEGE'S (1998) argument that staging can be applied as a learning mechanism. The entrepreneur and the investor learn more about the project's prospects during the development over time. This learning effect can be observed in our results in respect of both winners and losers.

Our results are robust even when controlling for different measurements on macroeconomic levels and portfolio company specific factors. We find that investments in high technology companies can enhance value, and that performance measurements are not influenced by the risk-free rate. A control variable's strongest relevance is to be found in the level of committed capital that investors in PE and VC funds raise at the time of investment. GOMPERS/LERNER (2000) consider increased capital inflows as an indication of a demand pressure for VC securities, which leads to higher prices. While this factor has no influence on the total sample, it has strong negative influence on the losers and, conversely, a positive impact on winners. Specifically, our findings mean that during periods of higher capital inflows into funds, fund managers buy into overvalued losers, but the winners will benefit from externally driven price with an increase, which also means that they will enjoy higher exit valuations.

5. Discussion and Conclusion

This study focuses on the question, whether or not we can find antecedents that influence the reduction of losses versus maximization of profits of venture capital and private equity investments. Our study is one of the first to provide a differentiated look at the influence of financing structures and behavior on the return of investment in private equity and venture capital financing. Our study extends previous research on entrepreneurial ventures (e.g. BARNEY ET AL. (1996); BUSENITZ ET AL. (1997); SAPIENZA (1992)), the performance of private equity funds (HEGE ET AL. (1998)), negative investment returns (AZOULAY/SHANE (2001); DUCHESNEAU/GARTNER (1990)), as well as the role of staging in venture capital investments (GOMPERS (1995); CALANOG ET AL. (2006), WITT/BRACHTENDORF (forthcoming)). For our analyses we focus on five variables, which have been identified as important factors in previous research: fund management experience, resource allocation, use of convertible securities and staging behavior during the initial and pre-exit investment phases. We perform the analyses on the basis of a comprehensive and objective dataset of 1.011 cases, which is a merged sample of the CEPRES and Venture Economics databases. This merged data sample enables us to calculate the investment performance precisely in IRR p.a. for each investment based the exact cash flows between the fund and the portfolio company.

We find that loss reduction and return maximization are associated with different determinants. Our findings confirm first, that management experience is specifically relevant for cutting losses, but not significant for maximizing returns. Second, our results show that the fund's management resource allocation is relevant for winners, but not for reducing losses. We third confirm that convertible securities are a strong instrument to mitigate risks and hence to minimize losses and obviously not to maximize positive returns. Fourth, we provide evidence that staging during the initial investment phase has positive influence on both, increasing returns of winners as well as losers. And fifth our results show that more intense staging during the pre-exit phase can be associated with critical situations on both levels, within the winner sub-sample as well as the sample of non-performing projects. Overall, our findings confirm the importance of the differentiated performance analysis, specifically for determinants on mitigation of risks versus maximization of positive returns.

The results extend the findings of previous studies, especially KAPLAN/STRÖMBERG (2003) in regards to the specific analyses of poor versus strong performing companies. Our findings hold implications for, and raise intriguing questions about the factors influencing the development of private equity investments. Despite the fact that there has been a lot empirical research on the predictors for positive returns the antecedents of minimizing losses has to our knowledge not yet been empirically investigated. From an empirical perspective, our study contributes by, for the first time, providing detailed analyses of VC and PE returns' determinants, and differentiating with respect to loss reduction versus profit maximization. From a theoretical perspective this study makes three contributions. First, it contributes to the discussion on the development of entrepreneurial ventures. Second, it contributes to the literature on staging by empirically testing how early and late staging effects value added by the investor. Third, it extends earlier research on the performance of private equity investments by developing and testing a model, which includes and compares the influence of antecedents of both positive and negative returns. Finally, it examines these issues with two merged a longitudinal databases. For entrepreneurs, the findings indicate the specific influence of financing instruments like convertibles. For investors, our study is one of the first to provide evidence of the factors that allow for a minimization of fund losses. In conclusion, our study has raised a number of interesting questions and provided a set of answers regarding the antecedents of losses in venture capital and private equity investments. It has taken a first step to help both investors and entrepreneurs to better understand the dynamics of private equity's negative returns and initiate a discussion on which future research may build.

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TABLES

Table 1: Frequency of regional, stage, industry and performance characteristics within the total data set and both sub samples.

	Total dataset (1011 cases)	**IRR < 0,0%** (384 cases)	**IRR >= 0,0%** (627 cases)
Regional distribution			
USA	59,5%	60,2%	57,7%
UK	10,9%	6,0%	13,4%
France	4,3%	3,4%	4,6%
Stages			
early	27,5%	42,4%	17,9%
expansion	18,6%	13,3%	21,4%
later	21,5%	15,4%	24,6%
Industry			
High tech	51,0%	59,6%	44,5%
Classic	14,3	9,4%	16,4%
Performance			
Mean IRR	62,2%	-66,2%	143,0%

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Table 2: Details of the distribution of log(IRR+1,1) within the total data set and both sub samples regarding regional, stage, industry and exit characteristics.

	Log (IRR + 1,1), total dataset		**Log (IRR + 1,1), IRR < 0,0%**		**Log (IRR + 1,1), IRR >= 0,0%**	
	Mean	Median	Mean	Median	Mean	Median
Regional distribution						
USA	-0,0616	0,1110	-0,5415	-0,8410	0,2445	0,3296
UK	0,0448	0,0980	-0,4546	-0,4999	0,1815	0,1961
France	0,028	0,1382	-0,4053	-0,3017	0,2222	0,2176
Stages						
early	-0,2782	-0,2830	-0,6799	-1,0000	0,3063	0,4714
expansion	0,0492	0,1465	-0,3797	-0,3276	0,2124	0,2721
later	0,0607	0,1176	-0,4151	-0,6438	0,2395	0,2210
Industry						
High tech	-0,0814	0,0451	-0,6042	-1,0000	0,3477	0,5311
Non-high tech	-0,0314	0,1111	-0,4598	-0,6647	0,1569	0,2220
Exit type						
IPO	0,3161	0,6306	-0,2264	-0,2092	0,4220	0,8753
Sale/Merger	0,0658	0,1801	-0,2713	-0,4061	0,2517	0,3852

Table 3: Details of the distribution of the investing fund's number of general partners within the total data set and both sub samples regarding regional, stage, industry and exit characteristics.

	ianzgp, total dataset			**inazgp, IRR < 0,0%**			**inanzgp, IRR>=0,0%**		
	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Regional distribution									
USA	2	9	21	2	9,32	21	2	8,86	21
UK	2	11,85	29	2	12,82	29	2	11,56	29
France	3	7,78	21	3	9,46	21	3	7,04	21
Stages									
early	2	10,46	21	2	10,80	21	2	10,08	21
expansion	2	10,26	21	2	11,59	21	2	9,87	21
later	2	8,88	21	2	9,48	21	2	8,75	21
Industry									
High tech	2	9,37	29	2	9,37	29	2	9,38	29
Non-high tech	2	10,81	29	2	12,17	29	2	10,18	29
Exit type									
IPO	2	7,69	29	4	7,54	9	2	7,77	29
Sale/Merger	2	10,29	29	2	10,10	29	2	10,46	29
Write off	2	9,92	29	2	9,92	29	Na	Na	Na

Table 4: Details of the distribution of the dummy variable within the total data set and both sub samples regarding regional, stage, industry and exit characteristics: portfolio companies per investment manager < 1,5 (equal to one if the number is below 1,5).

	PC / IM < 1,5, total dataset	**PC / IM < 1,5, IRR < 0,0%**	**PC / IM < 1,5, IRR>=0,0%**
Regional distribution			
USA	61,80%	53,50%	67,80%
UK	87.70%	100,00%	83,60%
France	20,90%	23,10%	20,70%
Stages			
early	51,10%	46,60%	58,90%
expansion	78,70%	78,40%	80,60%
later	57,00%	50,00%	60,80%
Industry			
High tech	56,80%	47,30%	65,20%
Non-high tech	74,00%	72,90%	75,90%
Exit type			
IPO	43,30%	37,50%	45,60%
Sale/Merger	66,60%	55,10%	74,00%
Write off	53,00%	53,00%	Na

Table 5: Details of the distribution of the use of convertible securities within the total data set and both sub samples regarding regional, stage, industry and exit characteristics.

	PC / IM < 1,5, total dataset	**PC / IM < 1,5, IRR < 0,0%**	**PC / IM < 1,5, IRR>=0,0%**
Regional distribution			
USA	29,40%	14,70%	39,00%
UK	47,30%	13,00%	57,10%
France	30,20%	7,70%	41,40%
Stages			
early	7,90%	1,20%	17,90%
expansion	42,60%	21,60%	51,50%
later	44,50%	30,50%	49,00%
Industry			
High tech	14,90%	3,90%	24,40%
Non-high tech	41,40%	22,50%	49,70%
Exit type			
IPO	18,00%	18,80%	17,10%
Sale/Merger	27,30%	20,00%	31,50%
Write off	0,00%	0,00%	0,00%

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Table 6: Details of the distribution of the variable (number of rounds during phase one divided by total number of rounds) within the total data set and both sub samples regarding regional, stage, industry and exit characteristics.

	P1 intensity, total dataset	P1 intensity, IRR < 0,0%	P1 intensity, IRR>=0,0%
Regional distribution			
USA	72,33%	68,83%	75,21%
UK	87,55%	87,68%	87,06%
France	73,26%	61,54%	77,59%
Stages			
early	67,53%	63,73%	72,19%
expansion	73,51%	76,04%	73,30%
later	84,82%	82,03%	86,55%
Industry			
High tech	70,98%	68,22%	73,05%
Non-high tech	80,58%	75,25%	83,66%
Exit type			
IPO	77,35%	65,21%	79,17%
Sale/Merger	75,35%	73,53%	77,09%
Write off	61,74%	Na	Na

Table 7: Details of the distribution of the variable (number of all tranches during phase three divided by total maturity of investment) for pre-exit staging within the total data set and both sub samples regarding regional, stage, industry and exit characteristics.

	P1 intensity, total dataset			P1 intensity, IRR < 0,0%			P1 intensity, IRR>=0,0%		
	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Regional distribution									
USA	0	0,5698	12,00	0	1,0904	12,00	0	0,2086	8,31
UK	0	0,9425	12,00	0	0,9940	4,44	0	0,9252	12,00
France	0	0,5365	5,90	0	0,9020	5,90	0	0,1876	2,12
Stages									
early	0	1,1359	12,00	0	1,4793	11,61	0	0,5711	12,00
expansion	0	0,6384	9,82	0	1,1514	9,82	0	0,3873	8,31
later	0	0,5005	12,00	0	1,0339	12,00	0	0,2753	4,19
Industry									
High tech	0	0,8402	12,00	0	1,3227	12,00	0	0,4100	12,00
Non-high tech	0	0,5373	11,61	0	1,1088	11,61	0	0,2550	8,31
Exit type									
IPO	0	0,1741	4,80	0	0,2378	4,80	0	0,0998	1,99
Sale/Merger	0	0,3434	8,31	0	0,3892	6,07	0	0,2403	8,31
Write off	0	2,4052	12,00	0	2,4052	12,00	Na	Na	Na

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Table 8: Description of variables used in the regression models

	Variable Name	Variable Description
Performance Measure	IRR [Log(IRR+1,1)]	The exact IRR (Internal Rate of Return) based on the investment cash flows from the fund to the portfolio company and return flow from the company to the fund. For the regression analyses, we use logs of (IRR+1,1) to conform to the Gaussian assumptions necessary for traditional linear regressions and to cover all positive and negative IRR results as well as write-offs
Experience	Number of General Partners	Number of general partners employed in the VC or PE fund
Resource allocation	Number of PC per IM < 1,5	Dummy variable equal to one if the number of portfolio companies per investment manager is below 1,5
Financing	Use of Convertibles	Dummy variable equal to one if convertible securities were used to finance portfolio company i
Staging-related Variables	P1rounds/allRounds	Ratio of the number of financing rounds during the initial investment phase to portfolio company i's total number of financing rounds
	P3_TrancheIntensity (#Tr/HD)	Ratio of the number of tranches during the pre-exit phase to the total duration of portfolio company i's investment
Control Variables		
Portfolio Company	High Tech	A dummy variable equal to 1 for companies in the high-tech sector [A company is classified as high tech if it belongs to one of the following CEPRES sector categories: HealthCare/LifeScience, IT, High Tech, Semiconductor, Software, Internet, Telecommunications]
Demand Measure	Committed Capital [log]	Committed capital on the overall market at date of investment (in real 2003 U.S. Dollars, in millions)* [For the regression analysis we use logs.]
Market	Risk Free Rate	The short-term interest rate at the date of the fund's initial investment in portfolio company i (for U.S. investments: The Federal Reserve Bank 1 month treasury bills; for EU investments: the BBA Labor rate)
	* The inflation adjustment is based on the Consumer Price Index (CPI) data for all urban households and all items. The data were derived from the U.S. Department of Labor's	

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Table 9: Regression models on the determinants of investment performance

Performance measured by the Internal Rate of Return (IRR)

The table presents the results of the OLS regression; the full data set includes 1,011 investments (one observation is per company, not per financing round). The cross heading indicates the dependent variable. The last four rows present the model diagnostics (Number of Observations, R square, Adjusted R square and the F statistic). Observations with incomplete data for the transaction were ignored. The first column defines the categories of the independent variables, the second column presents the variables. The unstandardized coefficients of the OLS regression are illustrated in the following columns. *, **, *** Significant at the 10%, 5%, 1% levels, respectively. Variables are as defined in Table 1.

		Model (1), IRR<0	Model (2), IRR >=0	Model (3), total dataset
		Dependent Variable = Log (IRR+1,1)	Dependent Variable = Log (IRR+1,1)	Dependent Variable = Log (IRR+1,1)
	Constant	0,552	-0,746	-0,143
Experience	Number of General Partners	0,009**	-0.001	-0.001
Resource allocation	Number of PC per IM < 1,5	0,036	0,051*	0,206***
Financin g	Use of Convertibles	0,365***	-0.049**	-0.218***
Staging-related Variables	P1 rounds/all Rounds	0,185***	0,088***	0,182***
	P3_TrancheIntensity (#Tr/HD)	-0.082***	-0.033***	-0.139***
Portfolio Company	High Tech	-0,008	0.180***	0.083**
Demand Measure	Committed Capital [log]	-0.249***	0,167***	-0.034
Market	Risk Free Rate	-0.005	0,003	-0.003
Model Diagnostics	Number of Observations	338	502	840
	R-square	0,336	0,199	0,257
	Adjusted R-square	0,320	0,186	0,249
	F Statistic	20,817***	15,299***	35.841***