

Private Equity performance: Can you learn the recipe for success?

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Abstract

In this thesis, I study the relationship between private equity fund managers' experience and fund returns. Previous private equity research has focused mainly on the performance persistence of fund returns and the contribution of this paper is to study the learning effect of private equity funds' general partners.

The data used in this thesis is collected from the SDC Platinum VentureXpert and the EurekaHedge Private Equity database. I restrict the study to US buyout and venture capital funds with vintages from 1980 to 2001. The VentureXpert data has an extensive coverage of funds in 1980's and 1990's whereas the EurekaHedge contains data on more recent funds. To investigate experience, I use the fund sequence as a proxy for the general partner's experience. To investigate the performance, I study the effect of experience on the successful divestment rate of the portfolio companies as well as different performance measure multiples that are commonly used in private equity research.

The central findings of the study imply that the managers' experience correlates highly with fund returns particularly as for venture capital. The same relationship is observable for buyout funds, as well, but not to the same extent. I also find a negative correlation between the fund size and the performance as for VC funds.

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1. Introduction

Private Equity as an asset class is not among the most studied topics in the field of finance due to the limited access to private equity placements and restricted access to quality data. However, during the last three decades, private equity placements have become an increasingly popular option among institutional investors, high net worth individuals and university endowments seeking above average returns. In 2016, private equity firms managed assets worth over \$2.49 trillion whereas the same figure in 2000 was under \$600 billion (Heberlein, 2017).

The private nature of private equity data poses significant challenges when evaluating the performance of this asset class. Private equity firms are not obliged to disclose any public data about historical fund performances and investors often have to settle for potentially biased accounting valuations of their investments during their investment period (Braun et al. 2017). Nevertheless, the performance of private equity funds has been studied lately, but with varying and contradictory results. According to Kaplan and Schoar (2005), private equity has historically outperformed S&P 500 index gross of fees but underperformed the index with fees taken into account. Kaplan and Schoar (2005) report also significant heterogeneity among fund level returns and find evidence for superior return persistence among the subsequent funds of top performing firms. The related academic findings, however, vary substantially based both on the used methods and the used data. A more recent study by Phalippou and Gottschalg (2009) indicates for more negative performance measures as for private equity, mostly due to differing assumptions.

Although private equity performance has been under academic scrutiny during the last decades, relatively little research has been concentrating on the drivers behind the returns. Therefore, this study focuses on further deepening our understanding of the persistence and evolution of performance of private equity funds. The absolute returns of funds and relative performance to benchmark indices are not of primary interest of this study, but it will rather focus on examining the explaining factors behind firm level return trends. The key aspect this study addresses is the learning effect of PE funds' general partners. This study aims to answer two questions:

- 1) Is there evidence that funds with more experienced general partners perform better?
- 2) If yes, is it due to expertise, fund size or a riskier approach of the general partners?

The study is structured as follows: In the second section, I address previous research around private equity performance and factors behind return trends after which I provide the theoretical motivation for the study and the research hypotheses. In the third section, I review the datasets used in the study and address possible data bias issues along the possible limitations of the data. The fourth section provides the assumptions and methods based on which the fifth section presents the data analysis, the presentation of results and further discussion. Lastly, the sixth section concludes the findings and implications of the study.

2. Literature review and hypotheses

2.1. Previous research

Private equity reflects a vastly different investment universe compared to the public securities market. PE funds are typically structured through a limited partnership agreement of 10 to 12 years where most of the capital committed is contributed by Limited Partners (investors) whereas the investment decisions and overseeing responsibility of the portfolio companies are centralized to General Partners (managers). GP's typically collect annual management fees amounting 1.5-2.5% of fund commitments and a carried interest of 20% of fund profits in the liquidation stage where the fund manager aims to realize the returns by selling the portfolio companies or through an IPO (Kaplan and Strömberg, 2009).

As private equity is a broad definition for number of different investment vehicles, the assessment of performance drivers must be correctly evaluated to reflect the nature of each private equity subclass. The primary classes of private equity in this study are buyout funds and venture capital funds. The nature and characteristics of these two fund types differ considerably from each other and, therefore, they require a different approach when evaluating factors that affect their fund returns. Buyout funds that acquire majority stakes in mature, low-performing companies, require different expertise and skillsets of their fund manager compared to, for example, venture capital funds acquiring minority stakes in early-stage growth companies. Albeit the differences between the two types of private equity, a conjunctive attribute in private equity is that the general partners aim to add value by steering and overseeing the portfolio company business by appointing their own personnel in the companies' boards and often controlling for the executive team composition. Especially venture capital firms are known for using reputation and expertise as a competitive advantage, as the most reputable VC's are able to acquire start-up equity at a

10-14% discount in exchange for superior steering expertise, large network of connections and for the knowledge on how to support sustainable business development and growth in early-stage companies (Hsu, 2004).

As PE performance studies have previously focused on addressing the question whether certain PE fund managers have been able to continuously outperform their peers, I continue to investigate the subject from a different perspective. Studying the effect of managerial expertise on fund level returns is a natural continuum for the previous study of PE performance persistence. Previous research of e.g. Kaplan and Schoar (2005) and Buchner et al. (2016) have found strong persistence among top performing fund managers, which raises new questions whether this kind of performance can be achieved by a riskier approach, by technical fund specifications or by better investment decisions of more experienced general partners. This study aims to further shed light on these questions.

To further investigate the theoretical motivation behind my hypothesis i.e. that PE fund managers learn to make better decisions over time, I firstly look into the persistence of PE performance and secondly investigate the reasons for this persistence. Performance persistence is an important factor when evaluating the learning effect, because without long term persistence, there would not be sustainable learning effect that would concretely affect fund performance.

Since Kaplan and Schoar's 2005 published seminal article on private equity performance and performance persistence, many others have conducted their own follow-up studies. The central findings in Kaplan and Schoar's (2005) study imply that, unlike in mutual fund industry, general partners whose funds have outperformed in the past are likely to outperform in the future, as well. They record a statistically significant positive coefficient on firms' successive funds' outperformance by constructing a regression model with fund performance as a dependent variable and same the GP's previous fund returns as explanatory variables. To put this in context, a 1% increase in the past fund performance (IRR) is associated with a combined 0.77% increase in successive funds. When comparing the performance persistence of buyout funds and venture capital funds, they find stronger performance persistence in venture capital funds (1% increase in the past performance is associated with 1.10% increase in successive funds) whereas for buyout funds, a 1% increase in the past performance increases successive funds' returns by only 0.26%. Kaplan and Schoar (2005) also record positive coefficients on the logarithms of fund size and sequence number, 0.09 and 0.20, respectively. This suggests that funds with more experienced

managers outperform funds with less experienced managers. However, they do not address this finding more specifically, nor do they examine the difference between venture capital and buyout funds.

The drivers of this performance persistence have been further studied by Buchner et al. (2016) who find that the risk that managers take is an important driver of performance persistence both in venture capital funds and in buyout funds. They conduct the study by investigating deal- and fund-level cash flow data from the Center for Private Equity Research (CEPRES) database and they measure risk as intra-fund return volatility. To further investigate the composition of fund level risk, they divide the total fund return volatility to downside risk and upside risk. By dividing the total volatility, they investigate whether fund managers' outperformance is driven by a superior ability to pick outperforming portfolio companies (higher upside volatility) or by a superior ability to minimize losses (lower downside volatility). They examine this by running a regression with the fund level IRR as a dependent variable and both the downside and upside volatility as explanatory variables. As a result, they discover that the coefficients for the downside volatility are much larger (7.3 times for buyout and 1.5 times for VC) than those for the upside volatility, which suggests that fund performance is driven rather by fund managers' ability to minimize losses than by their ability of selecting outperforming portfolio companies. Intuitively, selecting outperforming deals becomes increasingly important in venture capital universe, as most of the fund returns typically consist of only few successful exits. Buchner et al. (2016)

Korteweg and Sorensen (2017) continued to study the PE performance persistence with a variance decomposition model to better account for long term performance. As earlier studies broadly focused on explaining future performance with the performance of the previous (or two previous) funds, Korteweg and Sorensen argue that, with the variance decomposition model it is possible to study the persistence effect with data that spans over a longer period of time thus not being limited only to data concerning only the most recent funds. In an attempt to correctly explain the performance persistence, Korteweg and Sorensen divide the total persistence to investable persistence (skill) and noise (luck), which they observe with signal-to-noise ratios for smaller PE subsamples. The central findings in their study indicate that investable persistence is hard to find, but smaller funds seem to have a greater long-term persistence and more investable persistence than their larger equivalents, especially as for venture capital. Although the volatility of smaller fund returns is greater than for larger funds, the signal-to-noise ratio is also higher, which implies that

the performance of smaller funds is a more informative signal for investors as a greater proportion of the performance is driven by skill rather than by luck and random variance. They also argue that the location of a GP has a significant effect on the noisiness of performance persistence. They categorized the funds to three different location subclasses i.e. Europe, the US and ROW, and they showed that the firms located in Europe have a higher signal-to-noise ratio than their US and ROW equivalents, implying that European GPs carry, on average, a higher investable persistence. Korteweg and Sorensen (2017)

2.2. Theoretical motivation and hypotheses

Although private equity performance is, nowadays, a widely researched topic with somewhat established findings on overall performance and on the persistence of these returns, it is yet unclear why certain fund managers outperform their peers. Unlike in mutual fund industry, where the data is public and available for more rigorous scrutiny, PE, as an asset class, differs in many ways due to the lack of objective data and its exclusivity in form of high investment barriers and limited access to most popular fund placements. To build on previous research on performance persistence, I focus on the real value of the managerial expertise and experience that PE fund general partners provide for limited partners who invest in these funds. If positive outperformance can be divided into two components, skill and luck, it is of great importance to study whether the skill component can be developed in the process of managing private equity funds. Top performing general partners are likely to be prone to have above average luck, but as previous studies imply, that is not the whole truth.

In finance, practice rarely makes one perfect, but intuitively, experience should be an asset in every field of work. Learning the tricks of the trade regarding PE includes screening for potential investors, marketing new funds, finding attractive portfolio companies and developing their business, and ultimately exiting the investments through an IPO or by M&A. However, managerial expertise is hard to measure and due to the obscurity of the PE data, managers' experience is difficult to measure, as well. An important assumption in this study is that the sequence number of a given fund is a good proxy for a general partner's experience. This assumption takes into account that a part of the knowledge and experience is directly tied up with the management team of the fund, but a part of the knowledge can be attributed to the whole organization.

To test whether a skill can be developed to the extent where it can be claimed to have a positive effect on fund level returns, I test the following hypotheses:

H1: A higher fund sequence number leads to higher fund returns

If the fund sequence correctly reflects the experience of a given general partner and this experience affects fund returns positively, it should result in higher fund level returns measured with IRR, TVPI¹, DPI². A higher fund performance should also correlate with the successful exit rate of the portfolio investments.

H2: A higher fund sequence number leads to more stable returns

Given the volatile nature of private equity, managerial expertise could result in a lower downside risk when the process of screening investment opportunities becomes more sophisticated. If this is the case, a higher fund sequence number should lead to less heterogeneous returns across individual funds.

3. Private Equity dataset

As previously stated, the limited amount of reliable data on the private equity universe poses challenges when evaluating and benchmarking VC and buyout funds. As PE firms are not subject to similar information disclosure policies as their public market equivalents, most research have been conducted using information available from different commercial PE databases. These commercial databases collect information directly from PE firms and from LP's (investors), which may result in biases and weaken the data credibility. Potential biases and data credibility are further discussed in subsection 3.4.

This study utilizes data mostly collected from SDC Platinum's VentureXpert (former Thomson Venture Economics) private equity database, which is a commercial dataset provided by Thomson Reuters. Another data source used in this study is a commercially available private equity database provided by EurekaHedge.

¹ TVPI (Total value to paid in capital) = (Sum of all distributions + latest NAV) / Sum of takedowns

² DPI (Distributed to paid in) = Sum of all distributions / Sum of takedowns

Kaplan et al. (2014) studied the differences among different commercially available databases with heterogeneous results regarding performance reporting. They replicated the seminal private equity performance study by Kaplan and Schoar (2005) not by using the original Thomson Venture Economics database, but using a less biased commercial database by Burgiss and concluded that the performance data provided by Venture Economics suffers from a clear underperformance bias. Kaplan et al. (2014) argue that the PE database by Burgiss offers the most objective data regarding private equity performance as all the Burgiss data is collected directly from investors, which results in minimal potential bias. However, the relative performance is not of primary importance in this study as I focus on the differences in returns between funds rather than relative performance to public market equivalent investments. Therefore, VentureXpert private equity database fits well for this study due to its comprehensive data on fund attributes, portfolio companies and performance measures.

3.1. Fund level exit data

To investigate whether a higher fund sequence number affects fund managers' abilities to successfully liquidate the fund, it is essential, for this study, to have access to fund level data on vintage, size, sequence number, raising status and most importantly on portfolio companies and their status. The private equity data in VentureXpert covers investment data only until end of 2012 thus excluding most recent funds from this data. However, a more recent dataset is used to investigate the fund level performance later in this study. To account for the typical long investment horizon of PE funds, which affects the exit rate of portfolio companies, only liquidated funds raised between 1980 and 2001 are considered. To control for geographical differences on fund performance, only funds of the US based general partners are considered. Funds with less than \$3 million committed capital are excluded to focus on economically meaningful funds. With these restrictions, VentureXpert returned the fund level information on 2238 different PE funds with all the information requested.

Of these 2238 individual funds, VC funds dominate the sample with approximately 73% of observations (see Table I, p.9). Intuitively, majority stakes acquiring buyout funds outside VC funds averaging \$328.9 and \$75.3 million, respectively. However, this difference in sizes is largely driven by a few larger buyout funds as differences in median sizes are substantially smaller. There are no significant differences between buyout and VC funds regarding average sequence numbers of 3.16 and 3.33, respectively. Buyout and VC funds differ

considerably when examining the number of portfolio companies. Buyout funds acquire majority stakes in essentially fewer number of companies whereas VC investments tend to be far more diversified. An average buyout fund invests in just 8.31 portfolio companies whereas the same number for venture capital funds sets to 17.72.

SDC Platinum's VentureXpert data also allows to explore each funds' investments at the portfolio company level. For each portfolio company, VentureXpert data states in detail whether the portfolio company has been successfully exited through an IPO or by an M&A, or whether the company has gone bankrupt or is still active in the portfolio. By combining this data, the successful exit rate can be calculated for further investigation.

Table I
Descriptive Statistics, VentureXpert

The full sample of SDC Platinum VentureXpert US based funds with vintage 1980-2001. Funds with size under \$3 million are excluded. Fund sizes are reported in million US dollars. Sequence numbers refer to the subsequent funds raised by a given GP. Portfolio companies refer to the number of companies each fund has invested in. Observations refers to the number of individual funds.

Sample	Buyout Funds	VC Funds	All Funds
Average size	328.9	75.3	142.8
Median size	144.0	37.1	50.0
Minimum size	3.4	3.0	3.0
Maximum size	6,011.6	1,775.0	6,011.6
Average sequence number	3.16	3.33	3.29
Median sequence number	2	2	2
Average number of portfolio companies	8.31	17.72	15.21
Median number of portfolio companies	5	13	10
Portfolio companies total	4,955	29,090	34,045
Observations	596	1,642	2,238

3.2. Aggregate performance data

SDC VentureXpert does not allow to observe fund level cash flows directly, but it reports aggregate level cash flows which can be further defined by certain fund attributes. To obtain a meaningful dataset of aggregate fund cash flows, I limit the search to cover fund vintages from 1980 to 2001 with an US marketplace. To assort fund cash flow data to match given sequence number, I run the search individually for fund sequences 1-9 and 10+. I conduct the search for both VC funds and buyout & mezzanine funds for further investigation of possible differences. VentureXpert returned cash flow data including aggregate takedowns,

cash distribution, stock distribution and latest NAV³ for 1631 funds in total. Of the total sample of 1631 funds, 1068 were classified as VC funds and rest 563 were buyout & mezzanine funds.

3.3. Fund level performance data

As an alternative source of data for PE fund performances I utilize a smaller but a more complete dataset collected from a commercial financial data provider EurekaHedge. The total fund sample contains detailed performance data about 110 buyout funds and 65 VC funds (see Table II). A clear advantage of the data compared to VentureXpert is that EurekaHedge reports individually fund level performance measures (TVPI, DPI, RVPI & IRR) and contains data on most recent funds as well. Similarly to VentureXpert data, only liquidated funds are included in the analysis. As EurekaHedge provides financial data up to this date, vintages until 2004 are included.

Table II
Descriptive Statistics, EurekaHedge

Full sample of EurekaHedge database US based funds with vintage 1981-2004 and with all the information needed available. Fund sizes are reported in million US dollars. Sequence numbers refer to the subsequent funds raised by a given GP. Observations refers to the number of individual funds.

Sample	Buyout Funds	VC Funds	All Funds
Average size	1,588.1	457.0	1,168.0
Median size	1,025	265	640
Minimum size	81	20	20
Maximum size	6,130	2,200	6,130
Average sequence number	5.91	6.83	6.25
Median sequence number	4	7	5
Observations	110	65	175

As observable from Table II, EurekaHedge database contains data with a focus on more recent funds. Average sequence numbers and fund sizes differ considerably from those of VentureXpert, being substantially larger. This difference is likely to be driven by the fact that the average (median) vintage year of this dataset is 1998 (1999) whereas the fund vintages in VentureXpert data set to 1992 (1993). Due to a strong correlation between fund sequence

³ NAV = Net Asset Value

number and fund size, also fund commitments are substantially larger in the EurekaHedge dataset.

3.4. Restrictions in data and possible biases

Objective evaluation of private equity funds is difficult for various reasons. Commercially available databases differ in their reporting methods, data sources and in data availability. Fund managers have an incentive to highlight returns of their successful funds, which helps them in raising subsequent funds (Barber and Yasuda, 2017). Conversely, underperforming fund managers have an incentive to not to report their performances to commercially available databases. Kaplan and Schoar (2005) study whether selective reporting could create an upward bias to the Thomson Venture Economics (current VentureXpert) data. They find no evidence to support the hypothesis that fund managers would stop reporting performance measures in case that a given fund's performance declines, but they conclude that the general partners of successful funds are more likely to report performance of the subsequent funds than the general partners of underperforming funds (Kaplan and Schoar, 2005).

The most restrictive element in the EurekaHedge fund level performance data is the number of observations. This limits the credibility of findings as the statistical significance weakens. However, being able to address the performance measures at the fund level makes it possible to investigate the relationship between the fund sequence number and fund performance more thoroughly than with just the aggregate performance data. EurekaHedge (2017) also reports that their data is sourced from both general partners and limited partners, which helps to reduce possible data biases.

For a more accurate investigation of the fund level return performances, it would be beneficial to control for market cyclicity in terms of fund returns. This would require data that is not currently available with current resources. Using multiples such as PME⁴, which is a widely used performance measure for PE placements in previous research, would allow to control for market cyclicity. To control for possible dataset biases and fluctuations this study should be duplicated with different data from e.g. Burgiss, Cambridge Associates or Preqin. To account for possible risk differences in funds, I would need access to the deal level

⁴ Public Market Equivalent, market adjusted multiple how private equity placement returns compare to public market investments

fund data to study the impact of the volatility of investments and divestments on the overall performance.

4. Methodology

This section presents the methods and the assumptions behind the quantitative analysis of the thesis. First, I cover the methodology for investigating the relationship of funds' successful exit rate and managerial experience. Second, I go through methods used in studying the relationship of aggregate fund returns and fund sequences. The nature of this analysis is more of a robustness check due to data limitations. Finally, I address the investigation of EurekaHedge fund level return relationship to managerial experience.

In the first quantitative analysis, I use the fund's successful exit rate as a proxy for the fund performance. This is an intuitive motivation for addressing the fund performance without having access to detailed fund level performance, as successfully exiting the portfolio companies is the ultimate goal and source of profit of PE funds. Efficient divestment of portfolio companies is also a skill that develops along with experience and expertise and, therefore, reflects a relevant measure for this study. The successful exit rate has also been used in previous studies of PE performance by Hochberg et al. (2007) and Phalippou and Gottschalg (2009).

The SDC Platinum's VentureXpert database returns the data for each portfolio company in each fund's portfolio. To calculate the successful exit rate for each fund, I divide the number of portfolio companies that a given fund has exited through an IPO, by an M&A (pending Acquisitions are also accounted for) or by an LBO with the total number of companies in a given fund's portfolio. Assuming that the fund sequence serves as a good proxy for the general partner's experience, it is possible to observe the relationship between the GP's experience and the successful exit rate by running a regression with the successful exit rate as a dependent variable and the fund sequence as an explanatory variable. To control for other fund attributes, I rerun the regression with an extended set of explanatory variables accounting for the fund size and the number of portfolio companies. To investigate the relative effect of the explanatory variables, I use their logarithmic values. The regression model writes as follows:

$$\text{Successful Exit Rate}_i = \alpha_i + \beta(\text{FundSequence}_i) + \gamma(\text{FundSize}_i) + \delta(\text{PortfolioCompanies}_i) + \varepsilon_i \quad (1)$$

In the second quantitative analysis, I study the aggregate fund cash flow data to calculate performance measures for the funds of sequences 1-9 and 10 or greater. Due to data limitations, this acts as a robustness check to validate whether a growing fund sequence number implies any trends in the performance measures. The sample of funds is very close to the sample of the exit rate analysis and, therefore, fits well for the analysis. As the aggregate fund data that VentureXpert returns contains data on aggregate takedowns, cash distribution, stock distribution and latest the Net Asset Value, it is possible to calculate the TVPI (with and without NAV) and DPI which are commonly used performance measures for private equity. I calculate separately the TVPI with and without NAV, as Phalippou and Gottschalg (2009) argue that Net Asset Values that funds report might be overinflated and therefore, the TVPI calculated with NAV might be prone to an optimistic bias. In addition to the overall averages of the above-mentioned measures, I investigate the correlation between the logarithm of fund sequence and performance measures.

In the third quantitative analysis, I study the relationship between the direct fund level performance measures and the fund sequence. Similarly to the successful exit rate analysis, I investigate the relationship by running a regression. I run three separate regressions to explain the dependent variables TVPI⁵, DPI and IRR by the logarithms of fund size and sequence. I rerun the regressions for the VC and buyout funds, both individually and combined, to further investigate and discuss possible differences. The regression models write as follows:

$$\text{TVPI}_i = \alpha_i + \beta(\text{FundSequence}_i) + \gamma(\text{FundSize}_i) + \varepsilon_i \quad (2)$$

$$\text{DPI}_i = \alpha_i + \beta(\text{FundSequence}_i) + \gamma(\text{FundSize}_i) + \varepsilon_i \quad (3)$$

$$\text{IRR}_i = \alpha_i + \beta(\text{FundSequence}_i) + \gamma(\text{FundSize}_i) + \varepsilon_i \quad (4)$$

The results are reported in the same format as in the successful exit rate analysis.

⁵ EurekaHedge reports TVPI with NAV included

5. Results and discussion

5.1. Exit data findings

Table III (see page 15) presents the results for the OLS regression with the successful exit rate as a dependent variable and the logarithms of fund sequence, fund size and the number of portfolio companies as explanatory variables. The model implies clear differences between buyout and venture capital funds. For buyout funds, the coefficient on the logarithm of fund sequence (0.008) implies a positive but statistically insignificant effect on a given fund's successful exit rate, indicating that the fund sequence, and therefore managerial experience, would not explain well the increase in buyout funds' successful exit rate. However, the positive and statistically significant coefficient on the logarithm of fund size (0.021) implies a greater effect on how buyout fund managers succeed to exit their investments. This finding has multiple interpretations.

First, it is possible that bigger funds that invest in a greater number of portfolio companies and, therefore control for risk by diversifying their investments better, experience a greater successful exit rate in average. Second, it is possible that the sizes of the portfolio companies explain this result. Investing in smaller companies might result in a riskier portfolio thus leading to a lower successful exit rate. Third possible explanation is that fund size reflects better the skillset and reputation of a given fund manager. An intuitive motivation for this theory is that the general partners with more experience and with better reputation among limited partners are able to raise larger funds. This reputation is likely to be driven by past performance which, according to previous study by Kaplan and Schoar (2005), correlates with the future performance, as well.

Table III

Fund attribute effects on Successful exit rate

The Dependent variable is the percentage of successful portfolio company exits for a given fund. Log(FundSequence) denotes the natural logarithm of fund sequence. Log(FundSize) denotes the natural logarithm of total commitments of fund (USD million). Log(PortfolioCompanies) denotes the natural logarithm of the number of companies in the fund portfolio. The first value of the explanatory variable refers to the regression coefficient. The second value in parenthesis refers to the standard error. The third value refers to the t-Stat value. * indicates $p < 0.10$ **indicates $p < 0.05$ ***indicates $p < 0.01$

Dependent variable: Successful exit rate			
	Buyout Funds	VC Funds	All Funds
log(FundSequence)	0.008 (0.016)	0.033 (0.007)	0.025 (0.007)
	0.53	4.60***	3.79***
log(FundSize)	0.021 (0.009)	0.002 (0.005)	0.012 (0.004)
	2.24**	0.37	3.12***
log(PortfolioCompanies)	0.007 (0.012)	0.010 (0.005)	0.005 (0.005)
	0.61	1.94*	1.17
R ²	0.014	0.017	0.014
Observations	596	1642	2238

As the coefficient on the logarithm of portfolio companies (0.007) is positive but statistically insignificant, it is reasonable to question the theory that larger buyout funds would outperform because they invest in larger a number of portfolio companies.

The regression coefficients differ considerably as for venture capital funds. Unlike for buyout funds, fund sequence has a positive and statistically significant coefficient (0.033) on the successful exit rate of venture capital funds, whereas the impact of the fund size on the successful exit rate is nonexistent (0.002). Conversely to the buyout industry, venture capital fund managers seem to learn to exit the portfolio investments more efficiently over time. In section 5.2., I provide evidence that this translates as improved performance measured with other performance measures, as well. There are many potential explanations for the difference of these coefficients between buyout and venture capital funds. As the portfolio companies of VC funds are likely to be in a very early stage compared to buyout funds' portfolio companies, the impact of fund managers' expertise to exit success might differ between the two investment types. In other words, experienced venture capital fund managers might be able to deliver more value in form of developing portfolio companies' businesses and by providing guidance and industry insights. Even though the coefficient on the logarithm of portfolio companies (0.010) is not statistically significant at 5% level, it is

notably larger for venture capital funds, stressing the importance of a well-diversified portfolio.

To test my second hypothesis, i.e. that a higher fund sequence number results in less volatile returns, I investigate the relationship of the sequence number and the standard deviation of the successful exit rates. I do not find evidence for any trends implying that the sequence number would affect the volatility of successful exit rate between differing sequence numbers. I further investigate the relationship between the fund sequence and the fund level return volatility in section 5.3.

5.2. Aggregate data implications

The values in Table IV (see page 17) refer to aggregate performance measures for BO & mezzanine and VC funds separately. Due to the restrictions in the data, it is not possible to investigate individual data points⁶, but addressing the performance measures in aggregate is made possible. As with the fund level exit data, VC funds form the majority of funds compared to buyout funds. As the results in Table IV imply, there is no clear relationship between aggregate fund level performance measures and fund sequence. Figures I and II in Appendices, however, report an inclining linear trend on Total Value to Paid In, both as for BO & mezzanine Funds and VC Funds. For a more thorough investigation of this relationship, I will utilize the EurekaHedge data in the section 5.3. to further investigate the fund sequences and fund performance measures using fund level data.

⁶ Some researchers have been able to access anonymized VentureXpert fund level performance data, see e.g. Kaplan et al., 2014

Table IV

Aggregate fund performance measures by fund sequence

SDC Platinum VentureXpert data on the aggregate fund performance. Seq. denotes the fund sequence number. TVPI denotes the Total Value to Paid In which is calculated by the sum of total distribution and latest NAV divided by the sum of takedowns. TVPI* denotes the Total Value to Paid In with NAV written off. DPI denotes the Distribution to Paid In which is calculated by dividing the sum of cash distributions with the sum of takedowns. Obs. refers to the number of funds with each sequence number.

Seq.	BO & Mezzanine Funds				VC Funds				All Funds			
	TVPI	TVPI*	DPI	Obs.	TVPI	TVPI*	DPI	Obs.	TVPI	TVPI*	DPI	Obs.
1	1.41	1.05	1.00	143	1.72	1.32	0.90	247	1.51	1.14	0.97	390
2	1.51	1.29	1.21	130	1.36	1.07	0.64	213	1.47	1.23	1.05	343
3	1.49	1.25	1.21	83	1.33	1.03	0.55	165	1.44	1.18	1.00	248
4	1.52	1.33	1.29	58	1.73	1.36	0.71	105	1.59	1.34	1.09	163
5	2.05	1.82	1.80	37	2.21	2.04	1.09	75	2.10	1.88	1.61	112
6	1.89	1.64	1.52	31	2.17	1.94	0.77	60	1.98	1.74	1.28	91
7	1.77	1.40	1.40	14	1.99	1.78	1.11	52	1.89	1.60	1.24	66
8	1.72	1.58	1.54	16	1.54	1.30	0.77	39	1.63	1.43	1.13	55
9	1.40	1.34	1.33	9	1.75	1.19	0.66	24	1.57	1.26	1.01	33
10+	1.58	1.33	1.21	42	1.67	1.25	0.79	88	1.60	1.31	1.09	130

Correlation tables VII and VIII in Appendices also report a positive correlation between the logarithm of fund sequence and TVPI for both buyout and VC funds (0.37 and 0.32, respectively). This supports the hypothesis that funds with larger sequence number perform better.

5.3. Fund level performance data findings

Table V (see page 18) presents the results for the OLS regression with the fund level TVPI and IRR as the dependent variables and the natural logarithms of fund sequence and fund size as the explanatory variables. The OLS regression was also run with DPI as a dependent variable, but regression results are not reported in the table as they are highly correlated (0.99) with the TVPI offering no further insight.

The results imply some differences in buyout fund performance drivers compared to the calculations conducted with the successful exit rate as a performance proxy. When the fund performance is measured by the Total Value to Paid In and Internal Rate of Return, the fund sequences have positive regression coefficients (0.204 and 0.037, respectively) that are significant at a 10% level. This finding combined with the fact that the fund sequence has little or no impact on the successful exit rate, we can argue that even though the general

partners do not report higher successful exit rates, they might be able to exit the portfolio companies in a more efficient way as they get more experienced. Interestingly, the fund size does not seem to explain higher fund performance although it heavily correlates with higher successful exit rate. The regression coefficients on the logarithm of fund size are -0.024 with the TVPI and 0.002 with the IRR. Neither of these significantly differs from zero.

Table V

The effects of fund attributes on fund level performance measures

EurekaHedge fund level performance data. The dependent variables are TVPI (left-hand value) and IRR% (right-hand value). Log(FundSequence) denotes the natural logarithm of fund sequence. Log(FundSize) denotes the natural logarithm of total capital committed to fund (USD million). The first value of the explanatory variable refers to the regression coefficient. The second value in the parenthesis refers to the standard error. The third value refers to the t-Stat value. * indicates $p < 0.10$ **indicates $p < 0.05$ ***indicates $p < 0.01$

	Dependent variable: TVPI & IRR					
	Buyout Funds		VC Funds		All Funds	
log(FundSequence)	0.204 (0.115) 1.78*	0.037 (0.023) 1.61	0.774 (0.267) 2.90***	0.180 (0.056) 3.23***	0.240 (0.110) 2.19**	0.055 (0.022) 2.45**
log(FundSize)	-0.024 (0.091) -0.26	0.002 (0.018) 0.12	-0.576 (0.183) -3.14***	-0.098 (0.038) -2.57**	-0.070 (0.074) -0.95	-0.006 (0.015) -0.40
R ²	0.033	0.032	0.163	0.157	0.027	0.035
Observations	110	110	65	65	175	175

When investigating VC funds, the absolute values of regression coefficients are considerably larger. The model also seems to explain the performance of VC funds better than for buyout funds as the higher R squared value suggests. In line with the successful exit rate regression, the coefficient on the fund sequence is positive and statistically significant (0.774 and 0.180) for venture capital funds. As the regression coefficients on the fund sequences suggest, managerial experience seems to be more important for VC fund managers than for buyout fund managers. The regression coefficients for VC are considerably higher and suggest significant learning effect for the general partners regarding both the ability to successfully exit more portfolio companies and to drive more fund returns measured with TVPI, IRR and DPI.

What VC funds gain in the managerial experience, they seem to lose in the fund size. The regression coefficients on the fund sizes are negative (-0.576 and -0.098) and statistically significant. This implies that large venture capital funds do not seem to perform as well as

their smaller competitors. The negative relationship between the fund returns and the fund size has also been noted in previous research by Aigner et al. (2008), but they do not disclose the results for buyout and VC funds separately. As the regression results in the successful exit rate calculations suggested, the fund size has no significant effect on the exit success of VC funds unlike for buyout funds. According to the previous study by Metrick and Yasuda (2010), VC funds seem to grow at a considerably slower pace than what buyout funds do. This is likely to be driven by the fact that VC fund managers often commit to provide guidance and industrial expertise to the portfolio companies, which limits heavily the scalability of venture capital due to the scarcity of resources (Lopez-de-Silanes et al., 2015).

Table VI in Appendices reports the fund volatilities categorized by fund sequences. There is no observable clear trend among the volatility of fund returns across fund sequences. To further investigate the riskiness of the funds, it would be necessary to study the deal level data to account for the volatility of each investment and divestment more precisely.

6. Conclusion

In this study I have investigated the relationship between private equity fund managers' experience and fund returns. I have used the fund sequence number as a proxy for the managerial experience. Moreover, I have investigated how efficiently funds are able to exit their portfolio companies in terms of the successful exit rate and other performance measures such as the Total Value to Paid In and Internal Rate of Return, which are commonly used absolute performance measures when assessing private equity placements.

The central findings in this study reveal strong evidence for a positive correlation between the managers' experience and higher fund returns, particularly in the venture capital universe. For VC funds, a more experienced fund manager seems to be able to exit a larger proportion of portfolio companies successfully and deliver more value to investors in terms of the TVPI, DPI and IRR compared to an inexperienced manager. This relationship is observable in the buyout universe, as well, but on a smaller scale. Experience does not seem to affect the successful exit rate of buyout funds' managers, but it has a positive effect on the TVPI, DPI and IRR, although not statistically significantly so.

According to previous research, (see e.g. Kaplan and Schoar, 2005; Metrick and Yasuda, 2010; Marquez et al., 2015) more experienced general partners seem to be able to raise larger funds, but the fund size does not explain larger returns. Conversely, larger funds seem to

underperform especially in venture capital. The negative regression coefficient on the fund size has a significant effect on performance at 1% level for venture capital. For buyout funds, the amount of capital committed to fund does not have a significant impact on fund returns, but larger funds seem to be able to exit portfolio companies with a better probability. In practice, the findings of this study combined with previous research suggest choosing a more experienced general partner with a good historical track record, and choosing a venture capital fund with rather less than more capital committed to it.

For further research and more accurate investigation of the research problems, it would be beneficial to rerun the same tests with data from other sources, as well. In addition to the SDC Platinum's VentureXpert database, datasets by Burgiss, Preqin, and Cambridge Associates should be included in the study. The obscure nature of private equity data poses multiple challenges regarding the data gathering process, which is prone to various biases. To form an objective view on the matter, one would need to utilize multiple commercial datasets, which was not possible within the scope and timeframe of this study. To bypass the need for the experience proxy, duplicating the research with data on fund manager identities rather than fund sequences would provide more accurate results with better reliability. More precise data, including data about deal level cash flows, would also allow to control for the market cyclicity.

Appendices

Figure I

Aggregate fund performance measures by sequence

Data collected from the SDC Platinum VentureXpert. Figure plotted from the Table IV. The upper right-hand corner equation represents the linear trendline fitted to data. X-axis values denote fund sequences. Y-axis values denote TVPI (with and without NAV).

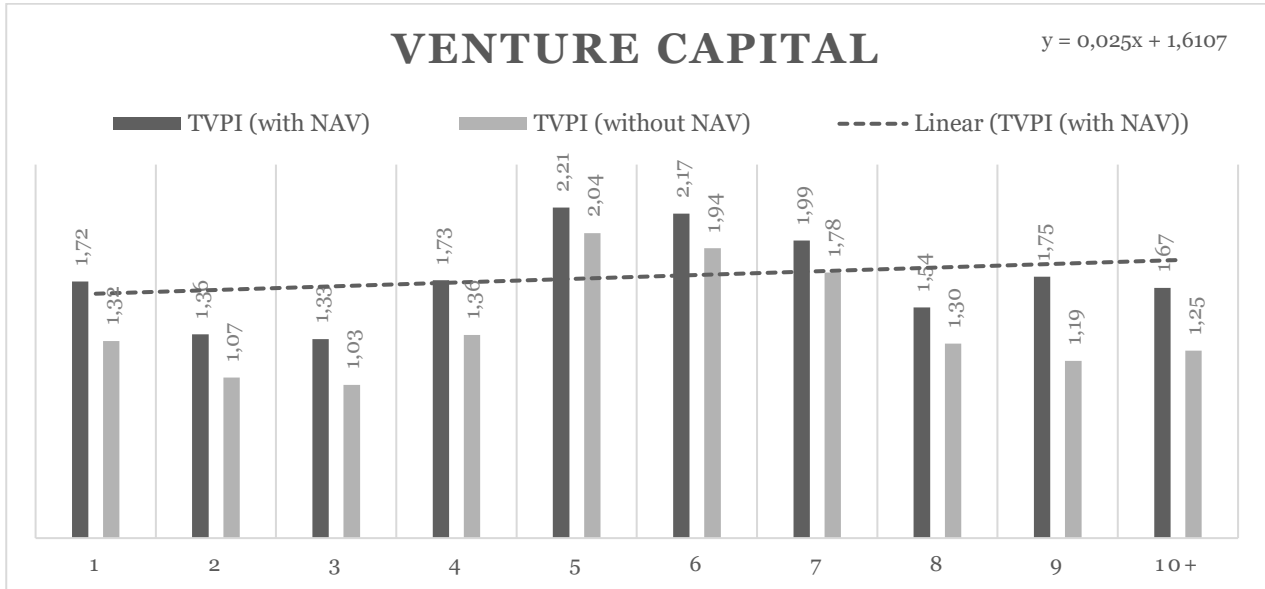


Figure II

Aggregate fund performance measures by sequence

Data collected from the SDC Platinum VentureXpert. Figure plotted from the Table IV. The upper right-hand corner equation represents the linear trendline fitted to data. X-axis values denote fund sequences. Y-axis values denote TVPI (with and without NAV).

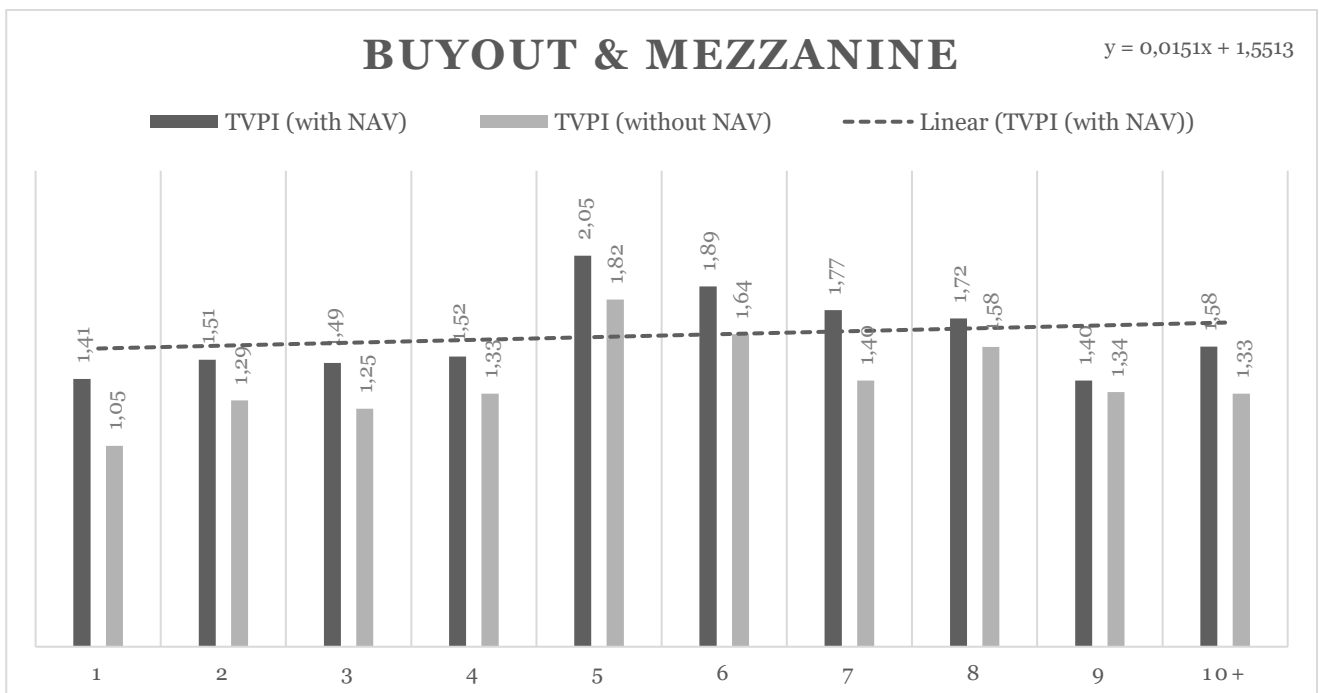


Table VI

Fund performance volatility by sequence

Fund level performance data from the EurekaHedge PE database. TVPI, DPI and IRR% reported standard deviations of given performance measure. Reported for each fund sequence number individually.

All Funds				
<i>Sequence</i>	TVPI	DPI	IRR	Observations
1	0.77	0.79	22.3 %	23
2	0.89	0.96	16.6 %	19
3	0.50	0.50	13.6 %	18
4	1.91	1.94	19.6 %	17
5	1.14	1.19	18.6 %	18
6	1.16	1.17	28.1 %	17
7	1.62	1.62	40.4 %	10
8	0.47	0.51	16.0 %	11
9	0.40	0.41	7.7 %	9
10+	1.11	1.13	28.4 %	33

Table VII

Correlation Table with aggregate fund performance data

Data collected from the VentureXpert aggregate fund performance dataset, Table IV. Log(FundSequence) denotes the natural logarithm of fund sequence. TVPI is calculated with Net Asset Value included. TVPI* is calculated with Net Asset Value excluded. DPI is calculated by dividing cash distributions divided with sum of takedowns. The upper value of each correlation cell refers to buyout funds, the second value refers to VC funds.

	<i>Log(FundSequence)</i>	<i>Sequence</i>	<i>TVPI</i>	<i>TVPI*</i>	<i>DPI</i>
Log(FundSequence)	1				
	1				
Sequence	0.952	1			
	0.952	1			
TVPI	0.372	0.210	1		
	0.317	0.251	1		
TVPI*	0.543	0.369	0.917	1	
	0.256	0.139	0.951	1	
DPI	0.544	0.363	0.891	0.982	1
	0.095	0.100	0.732	0.774	1

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