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ESSAYS ON INVESTMENT STYLE DRIFTS AND INDUSTRY RELATEDNESS IN PRIVATE EQUITY

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"It's one of the most important things at the end of the day, being able to say no to an investment."

Henry R. Kravis, Co-Founder of KKR

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BEA	Bureau of Economic Analysis
BO	Buyout
Cat.	Category
DIY	Do it yourself
e.g.	Exempli gratia (for example)
et al.	Et alii (and others)
EXP	Exponential
Exp.	Experience
FTSE	Financial Times Stock Exchange
GDP	Gross domestic product
GP	General partner
ICB	Industry Classification Benchmark
IEA	Industry Economic Accounts
IM	Investment multiple
Inv.	Investment
IO	Input-Output
IPO	Initial public offering
IRR	Internal rate of return
KKR	Company name (Kohlberg Kravis Roberts)
LBO	Leveraged Buyout
ln	Natural logarithm
m	Million
M&A	Mergers and acquisitions
MSCI	Morgan Stanley Capital International
Obs.	Observations
OEM	Original equipment manufacturer

List of abbreviations (2/2)

OLS	Ordinary least squares
p.	Page
PE	Private equity
PME	Public market equivalent
RoW	Rest of (the) world
S&P 500	Standard & Poor's 500 (stock market index)
SIC	Standard Industrial Classification
TS	Trade sale
TUM	Technical University of Munich
US	United States (of America)
USD	United States Dollar
VC	Venture capital
vs.	Versus
YTD	Year to date

Abstract

This dissertation investigates two subtle drivers of private equity investment returns. First, the determinants and performance implications of style drifting in private equity are analyzed. It is found that the drift activity of fund managers is influenced by general partners' characteristics, private equity competition and public market conditions. Furthermore, style drifting has a positive effect on the performance of buyout stage-oriented general partners. The investment practice of style drifting is discussed in the context of potential agency issues between general and limited partners. As a second subtle return driver the industry relatedness in buyout-backed trade sales is investigated. It is shown that buyout fund managers can reach higher returns in lateral than in synergetic trade sales. This effect is pronounced when holding periods of fund managers in the respective portfolio companies are short, when involved general partners are less experienced or when there is a moderate growth of public markets. It is argued that buyer-specific acquisition objectives and levels of information asymmetry cause the return differences. As private equity has become a major asset class with large amounts of committed capital and huge economic impact, a better understanding of subtle mechanisms that drive private equity investment returns is of both practical and theoretical importance.

Keywords: Private equity, buyouts, venture capital, investment style drift, style investing, buyout-backed trade sales, industry relatedness, public market equivalent

Zusammenfassung (German abstract)

Die vorliegende Dissertation untersucht zwei unterschwellige Treiber von Private Equity Investmentrenditen. Zum einen sind das Veränderungen des Investitionsfokus von Fondsmanagern im Verlauf der Zeit ("Style Drifts") und zum anderen die industrielle Beziehung zwischen Käuferunternehmen und zum Verkauf stehenden Unternehmen (Verkaufsobjekt) in einem Verkauf durch einen Buyout-Fondsmanager. Bezüglich des ersten Forschungsthemas werden die Einflussfaktoren und Renditeimplikationen von Style Drifts analysiert. Es zeigt sich, dass spezielle Eigenschaften eines Fondsmanagers, der Wettbewerb in der Private Equity Branche und die Gegebenheiten am öffentlichen Kapitalmarkt die Intensität beeinflussen mit welcher ein Fondsmanager seinen Investitionsfokus verändert. Des Weiteren zeigt die Analyse, dass Style Drifts einen positiven Einfluss auf die Gesamtrendite eines Fondsmanagers ausüben. Schlussendlich werden Style Drifts im Zusammenhang mit einem potenziellen "Principal-Agent" Konflikt zwischen Fondsmanager und dessen Investoren diskutiert. Das zweite Forschungsthema dieser Dissertation zielt darauf ab ob die industrielle Beziehung zwischen einem Käufer und eines Verkaufsobjektes in einem Verkauf durch einen Buyout-Fondsmanager dessen Rendite beeinflusst. Die empirische Analyse zeigt, dass ein Verkauf an einen Käufer, der in keiner industriellen Beziehung mit dem Verkaufsobjekt steht, höher ausfällt als wenn Käufer und Verkaufsobjekt in einer verwandten oder der gleichen Industrie agieren. Dieser Effekt wird durch eine kurze vorangegangene Haltedauer des Verkaufsobjektes durch den Fondsmanager, einer niedrigen Erfahrung des Fondsmanagers und eines moderaten Wachstums der öffentlichen Kapitalmärkte verstärkt. Bezüglich der dokumentierten Renditedifferenz werden unterschiedliche Akquisitionsgründe sowie Informationsasymmetrien der unterschiedlichen Käufergruppen diskutiert. Ein allgemein fundiertes Verständnis unterschwelliger Treiber von Private Equity Investmentrenditen wird immer relevanter, da diese Anlageklasse fortlaufend an ökonomischer Bedeutung gewinnt.

Schlagwörter: Private Equity, Beteiligungskapital, Buyouts, Venture Capital, Risikokapital, investment style drift, style investing, buyout-backed trade sales, industry relatedness, public market equivalent

I. Introduction[1]

1. Motivation and research topics

The long-running policy of cheap money by central banks has kept interest rates low for years. As a consequence investors face relatively high asset valuations and the challenge of how to generate above average returns. In this environment more and more investors decide to invest in private equity[2] funds. This asset class has registered increasing levels of capital inflow over the last years. In 2017 private equity fundraising approximates pre-financial crisis levels (Mooney, 2017). The ongoing interest of institutional investors[3] in private equity has led to enormous capital amounts available for fund managers[4] that they have to invest. In September 2017 the total dry powder in this asset class[5] was USD 780 billion[6]. In such an investment environment competition for interesting targets is high. This leads to increasing prices being paid for those targets. Gompers and Lerner (2000) call this phenomenon 'money chasing deals'. This challenge is also reported by current press articles, for example:

"Investors are pouring money into private equity in search of yield, driving near-record fundraising levels and speeding up the pace of inflows. On the spending side, managers are having a harder time finding attractive deals since asset values are generally considered high." (Mittelman, 2017)

While general partners aimed to generate returns of 20% or higher for their investors in the past, it is questionable whether they can reach those returns in the future. Although current research reports an outperformance of private equity on average in comparison to investments

[1] This section is partially based on the two essays in Section II.
[2] We use the term 'private equity' (PE) to include venture capital and buyout investments (Talmor and Vasvari, 2011, p. 4).
[3] Also referred to as limited partners.
[4] Also referred to as general partners or (private equity) management firms.
[5] Buyout and venture capital funds.
[6] According to preqin data; see Table 1-2 for details.

in public markets, this research also finds that the performance decreases with increasing fundraising (Harris et al., 2014). The current relevant question is: How can general partners reach above average profits in an environment of decreasing returns? The traditional measures of general partners for this task are the optimization of leverage, operations, strategy and exit timing. While the traditional measures are still important, and for high returns they have be implemented to perfection, there are more subtle mechanisms in the private equity investment cycle that contribute to the overall success of investments.

As already mentioned, the competitive private equity market leads to a shortage of promising investments and the high levels of dry powder create a certain investment pressure. In this environment, style drifting by general partners, an investment practice frequently observed in private equity (Cumming et al., 2009; Bubna et al., 2015; Buzzacchi et al., 2015; Bain & Company, 2016), can create concerns, because it alters the risk and return profiles of limited partners. In closed-end limited partnerships[7] investors base their investment decisions on the investment strategy communicated to them during the fundraising and they are not allowed to intervene afterwards. In this setting investors should be interested in the intentions of general partners when drifting. Do they drift because there is investment pressure and they are not able to find attractive targets in their ordinary investment foci? This could imply an uncalculated increase in risk without a corresponding gain in expected returns. On the other hand, it is possible that they drift because they have specific skills with which to identify attractive investment opportunities outside their normal investment areas. In today's challenging times this could be an advantage and positive for limited partners. Despite this practical importance research has not investigated style drifts in private equity sufficiently. Performance implications of this investment practice remain especially unclear. Therefore, the first essay of this dissertation addresses determinates and performance implications of private

[7] A closed-end limited partnership is the typical organizational structure of a private equity fund. For such a fund a general partner raises capital from investors upfront, which she invests afterwards over a pre-defined period. During this time the investors are not allowed to withdraw their committed capital (Kaplan and Strömberg (2009)).

equity style drifts. It drills down on the question of whether style drifts illustrate an agency conflict between general and limited partners. The topic and title of Essay 1 is:

Essay 1: Style drifting in private equity: When are drifts implemented and how do they affect investment performance?

In the context of competitive private equity markets, volatile stock markets have led to a decrease of IPO exits. Sales to strategic acquirers (trade sales) have been the dominant exit channel since the financial crisis (Bain & Company, 2017). Exit returns define the overall success of a general partner. When private equity overall industry returns decrease, a question for general partners is: How can I maximize my return? Since trade sales made up more than 50% of exit volume in 2016[8], practitioners should be further interested in the underlying mechanisms that determine the success of a trade sale. Are there return differences between certain buyer groups? Does industry relatedness between strategic acquirers and portfolio companies impact bidding prices? Theoretical and empirical research about private equity trade sales is limited, and buyout-backed trade sales especially have not been analyzed sufficiently. This is surprising, because they represent the dominant share of private equity trade sales. Furthermore, they provide potential for new insights, because they show special characteristics that cannot be observed in other transactions (e.g., traditional M&A or venture capital trade sales). For instance, the companies to be sold in buyout-backed trade sales differ from young ventures by being mature and having established organizational structures. On the other side, those companies differ from companies sold in the course of traditional M&A transactions, because they were optimized over the course of private equity ownership in terms of efficiency, strategy and financial structure. It can be noticed that a better understanding of return implications of buyout-backed trade sales is highly relevant in current times. Motivated by these considerations, this thesis explores the following research topic:

[8] According to preqin data; see Table 1-3 for details.

Essay 2: The return effects of industry relatedness in buyout-backed trade sales

Following this introduction of the two research topics analyzed in this dissertation, the next section gives a short overview of the private equity asset class, its theoretical foundations and the related literature. The last part of the introductory chapter presents the research approach and the main findings of the two essays. The main body of the dissertation contains the two essays: (1) *Style drifting in private equity: when are drifts implemented and how do they affect investment performance?* and (2) *The return effects of industry relatedness in buyout-backed trade sales*. The last chapter summarizes results, highlights theoretical and practical implications and concludes with an outlook on future research.

2. Background

This section provides background information for the two research topics of this dissertation: (1) style drifting in private equity and (2) return effects of industry relatedness in buyout-backed trade sales. First, an overview of private equity is given and the increasing importance of this asset class for the global economy is described. In this context, current challenges are highlighted. Next, the theoretical foundations and the current state of related research are presented. This section outlines the practical and theoretical context of the research questions. It then underlines the motivation and identifies research gaps.

2.1 Private equity as an asset class

The origin of private equity dates back to the 1930s and 1940s when wealthy families started to invest in private companies. The first venture capital firms were founded in the US in the late 1940s. In the 1960s the limited partnership as an organizational structure for funds was developed and Warburg Pincus was founded, which is considered one of the oldest private

equity firms still active today. Changes in the taxation of capital gains and in the set of regulations of pension funds led to the first boost of private equity as an asset class in the 1970s (Talmor and Vasvari, 2011, p. 5). Finally, in the late 1980s private equity became commonly known, because of its increased relevance in the economy and some attention-catching deals like the takeover of RJR Nabisco by KKR in 1988.

Today private equity is a well-established alternative asset class. Demaria (2013) describes private equity as "investments in private companies in privately negotiated transactions" (Demaria, 2013, foreword). The provided capital does not have to be equity; private equity transactions are often financed by debt as well. In a narrow definition private equity includes venture capital and buyout investments[9] (Talmor and Vasvari, 2011, p. 4). Typical venture capital investments are investments in young companies with innovative business models or technologies and high growth potential. Typical buyout investments are made in mature and established companies with proven business models and opportunities for financial engineering, efficiency improvement and strategy optimization (e.g., geographical expansion). A broader definition of private equity (not used in this dissertation) further includes mezzanine and distressed capital investments or investments in infrastructure and/or real estate. Compared to investments in public equity or bond markets, investments in private equity funds are more illiquid, risky and long-term oriented, because their organizational structure is a closed-end limited partnership. Here, investments are conducted by private equity fund managers (general partners) who invest the capital of their funds in promising portfolio companies according to a certain investment strategy (e.g., venture capital or buyout focus). They raise the capital from investors (limited partners), who are typically institutional investors like pension funds, insurers or university endowments[10]. The usual lifetime of a private equity fund is 10 to 13 years during which the limited partners are not allowed to withdraw their capital; the general partner has up to five years to deploy the capital and five to eight years to return it to the limited partners (Kaplan and Strömberg, 2009). The overall goal

[9] This definition is used by this dissertation.
[10] Customarily general partners provide a small share of the raised capital by themselves.

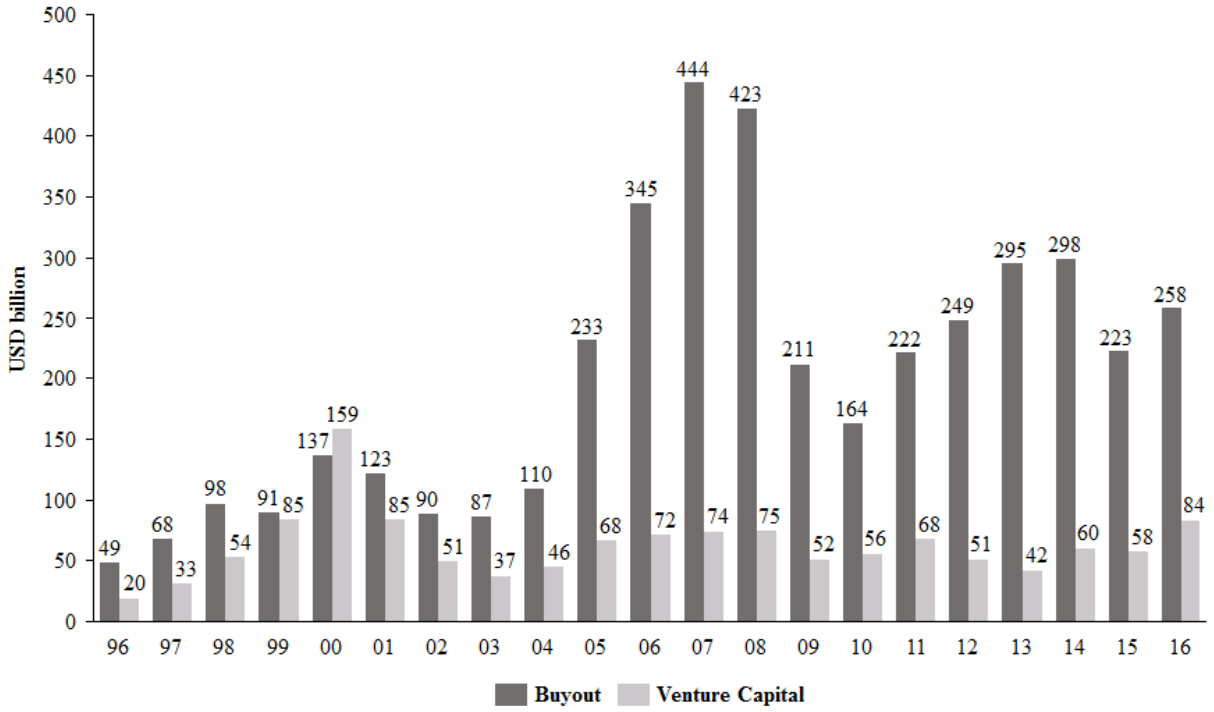
of this partnership between general and limited partners is to reach high returns through the right choice of investments, their development and a successful exit from them. General partners try to ensure this by an active management of portfolio companies, value creation through financial engineering, efficiency improvement, strategy realignment and exit timing (Kaplan and Strömberg, 2009). In return, limited partners accept the illiquidity of their invested capital and a rather high compensation for the fund managers[11].

The increasing importance of private equity can be observed by the increasing levels of capital flowing into this asset class. Figure 1-1 illustrates the development of private equity fundraising over the 20 years from 1996 to 2016. While venture capital and buyout funds raised less than USD 70 billion in 1996, they raised more than USD 340 billion in 2016. One can see in Figure 1-1 how boom and bust cycles of the economy affect private equity fundraising. Fundraising highs are registered during economy upswings and fundraising lows in the time after a crash occurs. The figure shows a steep increase of venture capital influx during the years of the dot-com bubble (1997 to 2000), and an equally rapid decrease afterwards. A similar, although more substantial, development can be observed for buyout funds over the years right before the financial crisis in 2008. The yearly capital inflow in buyout funds more than quadrupled from 2004 to 2007, ending up with the record level of almost USD 445 billion raised in 2007. Even though private equity fundraising follows the economic cycle, the absolute levels of capital flowing in this asset class are constantly increasing over time.

[11] The compensation of fund managers is usually mainly composed of management fees (an annual share of committed capital) and carried interest (a share of the overall profits of a fund).

Figure 1-1: Private equity fundraising over time

Figure 1-1 illustrates global private equity fundraising in USD billion by vintage years (1996-2016). It shows a difference between buyout and venture capital funds. Funds classified as generalist private equity, real estate, mezzanine, other private equity funds or fund of funds are excluded. The figure includes 5,492 buyout and 11,739 venture capital funds. The data is provided by Thomson ONE.



The increasing capital inflows of recent years have led to record amounts of capital available to general partners to invest. Figure 1-2 illustrates the development of private equity dry powder over time. At September 1, 2017 (YTD) the total amount of dry powder reached the record level of USD 780 billion (buyout funds: USD 605 billion; venture capital funds: USD 175 billion). Since 2000 this amount more than tripled. The growth has intensified in the last few years: In the first nine months of 2017 alone, the level of dry powder increased by almost +20%.

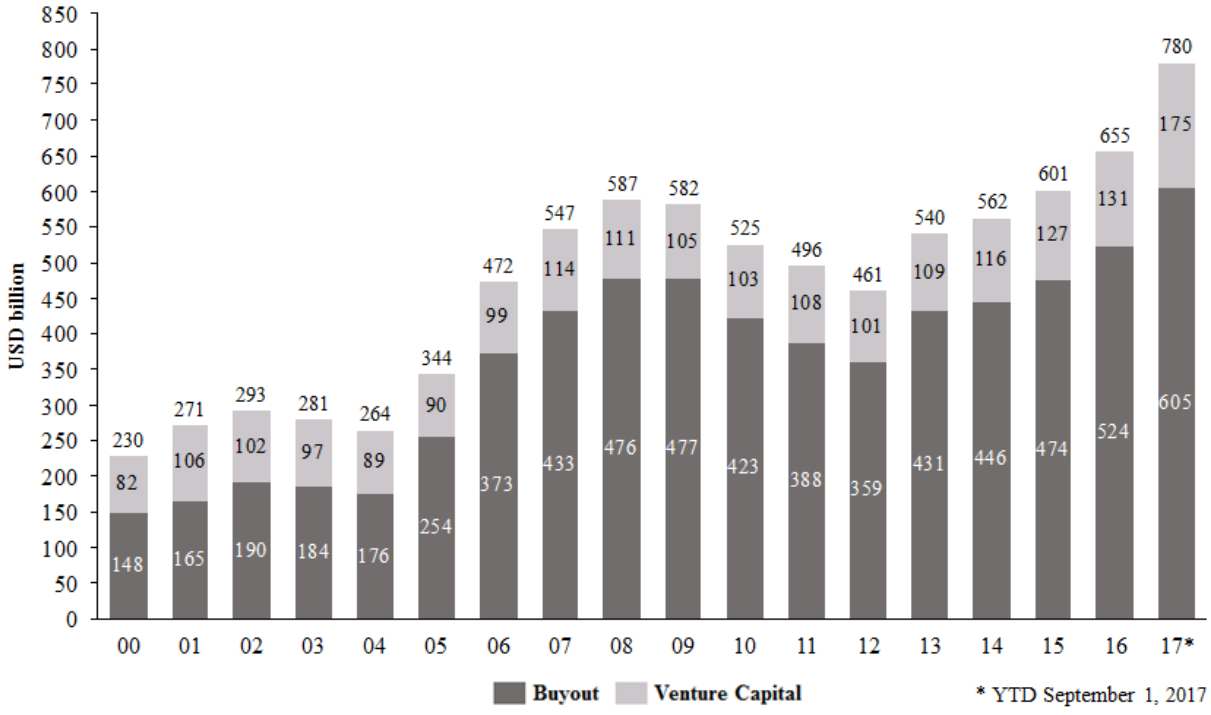
Together with the development of past fundraising, the available dry powder generates investment pressure for fund managers. They have to find investment opportunities that generate the relative high returns required by limited partners. This task is challenging,

because the high availability of private equity capital leads to an increase of prices for promising targets.

Under these circumstances fund managers are constantly seeking return-promising investments. Both topics, investigated in this dissertation, are relevant in this context. First, the adjustment of investment focus could be necessary to capture opportunities in current times. Second, to optimize the exit price by knowing from which interested party one can expect the highest bids is relevant as well.

Figure 1-2: Private equity dry powder over time

Figure 1-2 shows the global private equity dry powder in USD billion from 2000 to September 1. 2017. Dry powder is the capital available to general partners for new investments. The figure differentiates between dry powder for buyout and venture capital funds. Capital available for distressed, growth, mezzanine, real estate or other private equity funds is excluded. The data is provided by preqin.



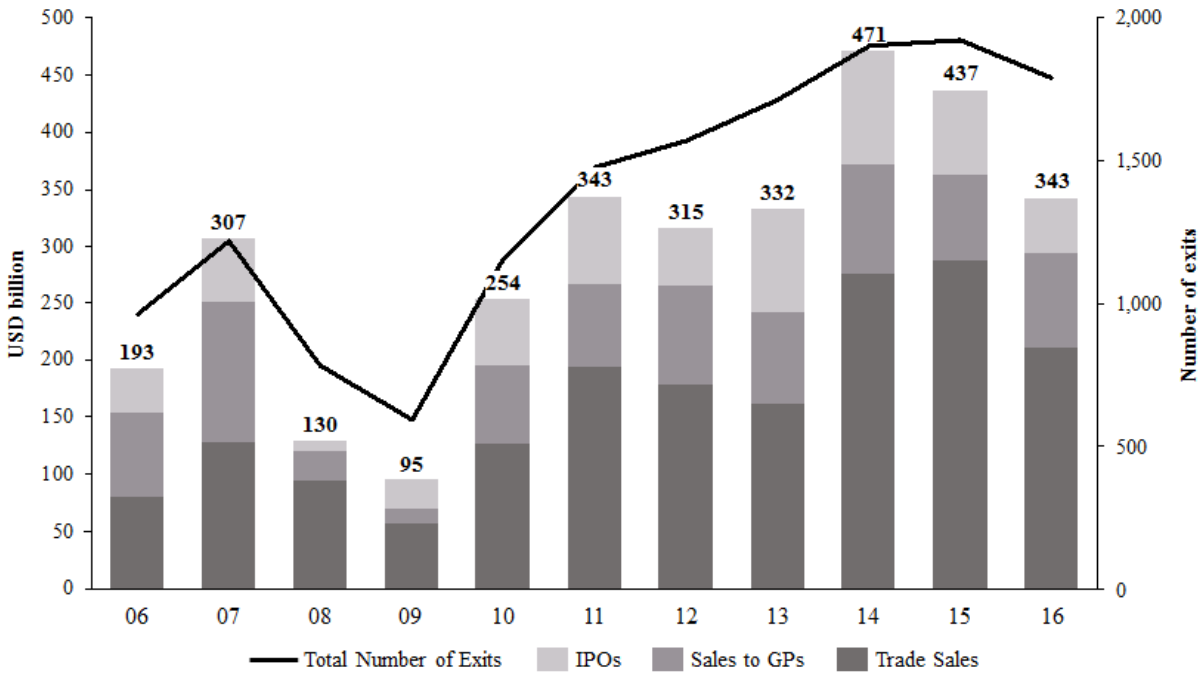
A general partner can choose between several ways to exit an investment in a portfolio company. Figure 1-3 shows the development of the volume of buyout-backed exits by exit type over time. Trade sales (sales of the portfolio company to a strategic acquirer) are the

dominant exit channel, sales to other general partners (secondaries) the second most important, and IPOs the third important way to exit an investment. Concerning the development of the exit volume in total, one can see a substantial growth over the last years. While the exit volume was USD 307 billion in 2007 right before the financial crisis, exit levels have exceeded this amount constantly since 2011. The absolute number of exits is also growing. In the depression year of 2009 general partners conducted 593 exits; in 2016 this number rose to 1,788.

In conclusion, the development of fundraising, dry powder and exits illustrate the increasing importance of private equity as an asset class.

Figure 1-3: Buyout-backed exits by exit type over time

Figure 1-3 shows the global exit volume for buyout-backed exits, separated by the most important exit types, in USD billion over the period from 2006 to 2016. Exits classified as sale to management, recapitalization and restructuring are excluded. It further illustrates the development of the number of exits. The data is provided by preqin.



2.2. Theoretical foundations and related literature

2.2.1. Private equity performance

Despite the undisputed importance of private equity for the global economy, there is only a limited understanding of private equity returns (e.g., Ljungqvist and Richardson, 2003a; Kaplan and Schoar, 2005; Robinson and Sensoy, 2011; Harris et al., 2014). Research identifies the lack of data as one main reason that returns and their determinants have not been investigated conclusively so far (e.g. Kaplan and Schoar, 2005; Robinson and Sensoy, 2011; Harris et al., 2014).

Most research about private equity performance is conducted on the fund level. This is because private equity firms are not under an obligation to communicate their performance per deal. Since private equity investments are more risky and illiquid compared to other assets, the comparison of performance is difficult (Talmor and Vasvari, 2011, p. 39). While a analysis on the fund level can help to describe the overall performance of a fund and allows for inferences on the return to limited partners, it cannot reveal performance differences between individual deals. However, to identify success and failure determinants of private equity deals this level of analysis is necessary. Performance investigations on the deal level are rare, because this data is very difficult to get. To measure performance accurately one needs to know the cash flows between the general partner and each of her portfolio companies. On the deal level gross cash flows before carried interest and management fees are usually analyzed, because the deduction of compensation is conducted on the fund level. On the fund level one can investigate both net and gross returns; the former is used to measure the return in the perspective of a limited partner, the latter is used to find out how successfully the general partner performed with her fund.

There are two commonly-used absolute measures of private equity performance: the Investment Multiple (IM) and the Internal Rate of Return (IRR) (Harris et al., 2014). Recent research increasingly uses the Public Market Equivalent (PME) as a relative measure of private equity performance in comparison to investments in public markets (e.g., Kaplan and Schoar, 2005; Harris et al., 2014; Sorensen and Jagannathan, 2015; Braun et al., 2017).

The IM is defined as proceeds divided by capital invested. On the fund level the proceeds (net or gross) are all cash flows received by limited partners from the general partners. The capital invested is the total amount the limited partner invested in the private equity fund. On the deal level, the total proceeds illustrate the sum of capital amount generated by the general partner over the whole investment duration[12] in a portfolio company (including dividends and proceeds from the sale of the portfolio company). The total invested capital is the sum of money the general partner invests in the portfolio company. Consequently, if the net IM is two on the fund level, the fund doubled the invested capital of the limited partners; if the IM is two on the deal level, the general partner doubled her investment in a specific portfolio company.

A main drawback of the performance measurement with multiples is that they do not consider the timing of cash flows. For instance, whether a fund is doubling its capital in three or in four years does not matter, because the IM will be always two. Furthermore, the measure does not include any risk adjustment. Whether the underlying investment is more or less risky does not influence the multiple.

On the fund level the IRR is defined as the discount rate that produces a net present value of zero of all cash flows between a limited and a general partner. Again, one can differentiate between cash flows net of fees to evaluate the perspective of a limited partner, or the performance of the fund manager gross of compensation components. On a deal level, the IRR is the discount rate that produces a net present value of zero of all cash flows between the

[12] Also referred to as holding period.

general partner and her portfolio company. The IRR is the return of an investment over the whole investment duration. The reference year for IRR calculations on the fund level is the vintage year of the fund. For a deal performance calculation it is the date of the first cash flow between the general partner and a portfolio company, normally the date of purchase. Assuming a private equity fund with a fund lifetime of 10 years, a final IRR of 20% (net of management fees and carried interest) would imply that the limited partners earned a 20% return on their invested capital over 10 years.

There are several drawbacks of the IRR performance measure. First, it is prone to the timing of cash flows. Two investments with the same cash flows in total and the same durations do not necessarily generate the same IRRs. If, for example, investment A is bought by USD 100 million in year one, and investment B is bought in two tranches of USD 50 million in years one and two, and all other cash flows in the 10 year investment duration are equal, the IRR of investment B will be higher. This characteristic of IRRs makes the measurement prone to manipulation (Sorensen and Jagannathan, 2015). Another drawback of the IRR is the so-called reinvestment hypothesis. It is assumed that after a portfolio company is sold and a certain return is generated, the cash received can be invested directly in another investment with the identical return (Talmor and Vasvari, 2011, p. 44). This assumption is problematic in the case of fund performance measurements, because funds' lifetimes last long and funds' capital is not always invested over that time. Last, the IRR, like the IM, does not consider any risk adjustment or market return development.

While there are several definitions of PMEs, that of Kaplan and Schoar (2005) is often used in research (e.g., Harris et al., 2014; Braun et al., 2017). It compares the return of an investment in private equity (fund or deal) with an equally timed investment in a comparable public equity market. More precisely, it is calculated as the sum of all cash outflows discounted by the respective public market index return, divided by the sum of all cash inflows discounted by the same public market index return (Kaplan and Schoar, 2005). The measure takes the value of one if the private equity return equals the return in the respective market index. A

value lower than one implies an underperformance and a value above one an outperformance of the private equity fund or investment. For example, a deal-level PME of 1.10, calculated after the exit of a portfolio company, indicates that the general partner generated a 10% higher return with the investment than she would have gained by the investment of the same capital amount in public markets (Harris et al., 2014). The comparison with public market returns is often more expressive than the IRR or IM. Given a bullish market environment, for example, an IRR of +20% or higher can still represent a smaller return than a return generated by an investment in the public equity market. Without a benchmark the interpretation of absolute performance measures is difficult. Furthermore, Sorensen and Jagannathan (2015) describe the PME as "robust to manipulation" (Sorensen and Jagannathan, 2015, p. 48); this can be especially relevant in the comparison to IRRs. There are also limitations of the PME: First, the measure is appropriate for ex-post performance analyses and not suitable for forecasts (Sorensen and Jagannathan, 2015). Second, the measure does not incorporate any illiquidity considerations, which could be important in the evaluation of a limited partner's general asset class allocation (Sorensen et al., 2014; Sorensen and Jagannathan, 2015).

As a consequence, based on the advantages of PMEs in comparison to the other absolute performance measures, this dissertation uses the PME as the main performance measure.

A great number of private equity studies exist. The following paragraph presents results of a selection of influential studies on relative private equity performance in comparison to public markets. Interestingly, existing research reports inconclusive results on whether average private equity returns exceed the performance of public equity markets in the long run.

Kaplan and Schoar (2005) investigate the returns of 746 private equity funds in comparison to the S&P 500 over the period 1980 to 1997. They find that average fund returns net of fees approximately equal the index return. Their findings suggest that average fund returns gross of fees outperform the index[13]. Phalippou and Gottschalg (2009) use a similar sample

[13] However, since Kaplan and Schoar (2005) and Phalippou and Gottschalg (2009) use fund cash flows from Thomson Venture Economics their results could be downward-biased. Stucke (2011) and Harris et al. (2014) mention serious concerns about the data quality in Venture Economics, because there are problems with the data

analyzing the returns of 852 funds over the period 1980 to 2003. They report that the average fund return net of fees per year was 3% under the benchmark return in public markets (the S&P 500 in this case). Like Kaplan and Schoar (2005), Phalippou and Gottschalg (2009) estimate that the fund performance gross of fees outperformed the S&P 500 (by 3% per year)[13]. On the other hand, there are also studies reporting a strict outperformance of private equity funds. Ljungqvist and Richardson (2003a) investigate data of 73 mature venture capital and buyout funds[14] raised over the period 1981 to 1993. They document excess returns (net of carried interest and management fees) of more than 5% compared to the S&P 500 and more than 2% compared to the Nasdaq Composite. Robinson and Sensoy (2011) investigate the PME performance measure of a more recent sample of 837 private equity funds from 1984 to 2010. They find that, on average, the analyzed funds outperformed the public market (in this case the S&P 500) net of fees by about 15% over the lifetime of a fund. Furthermore, they report that buyout funds perform better than venture capital funds (in absolute and relative terms). Finally, Harris et al. (2014), in their investigation of nearly 1,400 US-based private equity funds, document that US buyout funds have outperformed public equity markets net of fees for most years from 1984 to 2008 (sample period). Their findings suggest that this outperformance on the fund level is at least 20%. For venture capital fund returns they show a more ambiguous picture: while returns in the 1980s underperformed public market returns, they outperformed them strongly during the 1990s. For more recent fund vintages this pattern reverses again; Harris et al. (2014) report an on-average underperformance of venture capital fund returns in comparison to investments in the public markets for the 2000s.

In conclusion, even if studies report different relative performance results, private equity funds create substantial returns on average. For buyout funds the majority of recent studies report returns above those of investments in public equity markets. However, it is important to note that the literature reports high standard deviations (Fleming, 2010), meaning that there

maintenance. Harris et al. (2014) therefore suppose that the private equity fund returns reported by Kaplan and Schoar (2005) and Phalippou and Gottschalg (2009) are too low.

[14] Mature funds are defined as funds that are ten or more years old (Ljungqvist and Richardson (2003a)).

are some really good-performing general partners, but also some rather bad-performing ones. The choice of the 'right' fund manager can make a huge difference for limited partners.

Harris et al. (2014) find that aggregate capital inflow into private equity funds is related with lower subsequent performance. This is consistent with the investigations of Kaplan and Strömberg (2009) and Robinson and Sensoy (2011), which report similar findings[15]. Gompers and Lerner (2000) call this phenomenon 'money chasing deals'. The process behind it is that increased capital inflow creates an excess supply of capital in the private equity asset class that in turn leads to increased competition for interesting targets, thus to high prices for those companies and eventually to lower subsequent investment returns (Fleming, 2010). Concerning the time-wise development of fund performance, Higson and Stucke (2012) find for US-based buyout funds a downward trend in absolute returns over time. Harris et al. (2014) find also decreasing median IRRs and IMs comparing buyout funds' average performances in the decades 1980s, 1990s and 2000s. These research findings underline the tense current situation in the global private equity market, with record levels of dry powder indicating decreasing future returns and an overall downward trend of returns. Building on that, a better understanding of subtle mechanisms driving private equity returns is required.

2.2.2. Style drifts in private equity

A style drift is a change of the investment focus of a general partner. To detect a style drift one can compare a new investment to the pre-defined or the ordinary investment focus. The pre-defined investment focus is usually fund- or general partner-specific and is communicated by the fund manager during fundraising, thus before any investment is conducted. The ordinary investment focus is defined by the real past investment behavior of a general partner over time. The investment focus of a private equity firm or fund is defined by certain characteristics of the portfolio companies in which the general partner is invested. The typical

[15] Robinson and Sensoy (2011) find the negative relation between private equity fundraising and subsequent lower returns only for absolute performance measures without exception.

style-determining characteristics are the industry, the geographic location and the development stage of the companies in a fund manager's portfolio. Finally, one usually considers the capital amounts invested in these companies to end up with a weighted-investment style (Sahlman, 1990; Langer et al., 2007; Cumming et al., 2009; Buzzacchi et al., 2015).

There are three main reasons that style drifts are relevant in private equity, especially for limited partners. First, style drifts are observed frequently in private equity (Cumming et al., 2009; Bubna et al., 2015; Buzzacchi et al., 2015; Bain & Company, 2016). Second, style drifts seem to affect the performance of private equity funds (Langer et al., 2007; Cumming et al., 2009; Bubna et al., 2015), but how remains unclear. Third, they remove a crucial risk-taking decision from limited partners. This is because private equity funds usually work in closed-end limited partnerships where investors are not allowed to withdraw capital or participate in investment decisions until the fund's lifetime ends. If the general partner promised to invest in portfolio companies that meet certain style criteria and she alters these criteria over time, this could influence the risk and return profiles of limited partners' portfolios.

Based on the practical importance of style drifts in the private equity industry the investigation of their determinants and performance implications is an important research question (Cumming et al., 2009; Buzzacci et al., 2015). In the following, the current state of research about style drifting in private equity is summarized and limitations are highlighted.

The impacts of general partner's age, public market conditions and private equity competition on style drifting activity are discussed in existing research. Starting with general partners' age Cumming et al. (2009)[16] find a positive impact of it on the drifting activity and argue that young fund managers drift less, because they want to signal their ability to find attractive

[16] Cumming et al. (2009) investigate style drifts (limited to development stage drifts) in 11,871 US private equity investments on the fund level between 1985 and 2003.

targets within their predefined investment foci. Further, they do not want to provoke limited partners, because they depend on them in future fundraising rounds. In contrast, Langer et al. (2007)[17] report a negative effect of fund managers' age on their drifting activity. They explain this result by the networks, reputation and experience of older general partners, which they can use to source investment opportunities within their investment foci. The findings of Buzzacchi et al. (2015)[18] are in line with this argument. They suggest that higher reputation is linked with a lower willingness to increase the risk of a fund by downward stage drifting[19].

Concerning the impact of public market conditions, Cumming et al. (2009) report that they affect style drift activity of venture capital and buyout funds differently. While venture capitalists drift less during favorable market conditions, there is more drift activity in buyout funds[20]. Langer et al. (2007) also find a negative impact of market conditions on style drift activity. They explain this finding with the argument that favorable market conditions foster the creation and development of companies, thus creating attractive investment opportunities. Buzzacchi et al. (2015) put this in the context of fund managers' risk-taking. They assume that a downward drift in the development stage of an investment in comparison to the existing portfolio is connected with an increase in risk (and vice-versa). For boom periods they report that venture capitalists tend to take more risk by downward drifting.

The next relevant determinant of style drift activity is competition in the private equity industry. Langer et al. (2007) find a positive impact of the committed capital to private equity and the number of new funds raised on the probability of style drifts. Both factors can be seen as proxies for investment pressure and competition. Related to this, Bubna et al. (2015)

[17] Langer et al. (2007) analyze style drifts (limited to development stage drifts) in 426 private equity investments on the general partner and fund level between 1986 and 2003.
[18] Buzzacchi et al. (2015) investigate style drifts (limited to development stage drifts) in 1,925 venture capital investments by 149 venture capitalists during the period from 1998 to 2007.
[19] A stage drift is a style drift that is defined only by the investment characteristic development stage of a company (and not by industry, geographical location and invested capital). Buzzacchi et al. (2015) argue that a downward stage drift to investments in early ventures is associated with an increase in risk of the general partner's portfolio.
[20] It is possible that this finding is biased, because Cumming et al. (2009) measure style drift according to changes of the development stages of portfolio companies. Since early stage investments are more risky, it is logical that fund managers invest in this type more strongly during times of favorable market conditions.

analyze the level of dry powder and find a positive impact on VC style drift activity. Altogether it seems that competition in private equity leads to more changes in investment styles of private equity fund managers.

There are also some insights about the performance implications of style drift. Interestingly, the results are contradictory. Langer et al. (2007) and Cumming et al. (2009) report a positive effect of style drifts on investment performance, while Bubna et al. (2015) present evidence for the opposite.

The existing studies about style drift in private equity have several limitations. First of all, not all studies analyze both buyout and venture capital investments. Bubna et al. (2015) and Buzzacchi et al. (2015) restrict their investigations to venture capital investments. Second, most of the studies are constrained to drifts in portfolio companies' development stages (stage drifts), ignoring the other components of investment style (industry and geographical location of portfolio company and relative capital amount invested). Third, there are several ways to measure performance that have not been considered in the context of private equity style drifts. Based on data limitations, Cumming et al. (2009) and Bubna et al. (2015) only use performance proxies[21] instead of the measures described in Section 2.2.1. They both state that detailed cash flow information would be useful to accurately analyze performance implications.

In sum, there is no study that investigates determinants and performance implications of style drifts in private equity in a comprehensive way. More precisely, there is no study that combines the consideration of buyout and venture capital investments, the analysis of style drifts measured by the four mentioned investment style criteria and the investigation of precise performance measures like the PME.

[21] Cumming et al. (2009) use the type of exit as a performance proxy. IPOs are considered as successful exits and all other types of exits (e.g., trade sales) as unsuccessful. Bubna et al. (2015) use the exit likelihood and the time-to-exit as performance proxies. Successful exits include IPOs, mergers and acquisitions and secondary sales.

In addition, a style drift can be seen as a principal agent issue. According to the principal-agent theory (Jensen and Meckling, 1976), in the collaboration of a closed-end limited partnership the private equity fund manager can be seen as the agent and the limited partners can be seen as principals. Once limited partners have invested in a fund, the general partner is typically not obligated to ask for any more investment permissions (Axelson et al., 2009). In this state, one can assume that the general partner is supposed to maximize the utility of limited partners, which is most likely a function of risk and return. Since private equity investors take their investment decisions ex ante (Axelson et al., 2009), their main basis of decision-making is the predefined or ordinary investment strategy of the general partner. If the general partner deviates from this strategy (style drift) this can be interpreted as an agency issue. The underlying question is why fund managers drift? If they opportunistically drift, based on superior information, that can be in line with the interests of their investors. But if they drift because they are unable to find suitable investments within their ordinary investment foci or because they want to maximize their own profits that could illustrate an agency conflict. An answer to this question has strong practical relevance. In the current private equity environment characterized by high investment pressure and competition, fund managers face the challenge of generating high returns. It can be assumed that style drifting will increase rather than decrease under these circumstances. Understanding whether this investment practice is related to positive or negative investment returns, thus shedding light on the potential agency issue, is scientifically and practically relevant.

2.2.3. Industry relatedness in private equity transactions

The relatedness hypothesis (Barney, 1988) states that relatedness between two companies can create value in the context of a M&A transaction. In the private equity industry value creation can be measured by the return that is generated by the exit of a portfolio company at the end of the holding period. In this context, the industry relatedness between the portfolio company and the buyer is a crucial differentiator (Barney, 1988; Bruner, 2004; Fan and Goyal, 2006;

Rigamonti, 2012) and can be used to analyze return effects of relatedness in private equity transactions. Two companies can operate in unrelated or in related industries. In the first case there is no industry relatedness and an acquisition between such companies would be called "lateral". If the companies work in related industries, an acquisition would be called "synergetic". Synergetic acquisitions can be subdivided in "vertical" and "horizontal" acquisitions (Raudszus et al., 2014). An acquisition is called horizontal if the buyer and the target company are active in exactly the same industry. It is called vertical if both operate along the same value chain, e.g., supplier and OEM.

A general M&A literature overview by Bruner (2002) concludes that the relatedness between acquirer and target has a positive return effect (Bruner, 2002 with reference to, e.g., Berger and Ofek, 1995; Comment and Jarrell, 1995; Walker, 2000). In a later study Bruner (2004) qualifies this conclusion and states that the effect of relatedness is not so clear. He adds for consideration "that the degree of relatedness does matter, though perhaps in ways more complicated than even a variety of studies can capture" (Bruner, 2004, p. 69).
The complexity of relatedness in the context of M&A success stems from a variety of different M&A strategies. On the highest level one can differentiate between a strategy of focus and a strategy of diversification. The first is based on potential synergies that might be achievable between related companies. The second builds on the concept of risk reduction.

Typical arguments for an acquisition of a related company are an increase in the market power of the combined entity and the generation of efficiency gains. Advantages of an increased market power can originate from an improved position in setting prices or purchasing goods and resources (Seth, 1990; Haleblian et al., 2009; Shenoy, 2012). Furthermore, an acquisition can lead to more control of the exchange of critical resources in a specific industry. This foreclosure effect can be used to weaken competitors (Salinger, 1988; Hart et al., 1990; Ordover et al., 1990; Shenoy, 2012). The generation of efficiency gains between related companies can be achieved by the exploitation of synergies through cost

reductions and economies of scale (Coase, 1937; Seth, 1990; Villalonga and McGahan, 2005; Shenoy, 2012; Cefis et al., 2015).

On the other side, typical arguments for an acquisition of an unrelated company are an easy market entry, the accompanied information access and the diversification of the new created firm. An acquisition can be an easy and fast way to enter a market/industry with high entry barriers and valuable knowhow (e.g., Trautwein, 1990; Martin and Sayrak, 2003; Cloodt et al., 2006). The other reason for an acquisition of an unrelated company can be the strategic objective of diversifying the business. Diversification can reduce the risk of being vulnerable to recession periods (Martin and Sayrak, 2003). Diversification can further help to generate economies of scope (Seth, 1990; Cefis et al., 2015), like the utilization of excess capacity in capabilities and resources (Martin and Sayrak, 2003).

The success of an acquisition is dependent on the price the buying firm pays the selling firm. A too-high price can offset all strategic advantages of an acquisition. Information asymmetries between the buyer and the seller with respect to the target's business play an important role in M&A price negotiations (Capron and Shen, 2007; Achleitner et al., 2014). The theory of asymmetric information traces back to the early studies of Akerlof (1970), Spence (1973) and Stiglitz (1975). Reuer (2005) summarizes the reasons that levels of information are potentially asymmetric in M&A transactions. Acquirers often struggle to value the resources of the target. Factors like time pressure, organizational complexity, unfamiliarity of products/markets or complex intangible assets frequently arise, and can hamper the efficient valuation of a target. Furthermore, the seller, who could help to reduce information asymmetries, has no incentive to reveal unfavorable information about the unit to be sold (Reuer, 2005).

In the context of industry relatedness it is assumed that information asymmetries are lower in acquisitions of related companies (Achleitner et al., 2014). This is because related firms operate in the same or similar industries and have available solid business insights and

judgment. This information advantage in synergetic transactions could lead to higher prices, because it lowers transactions costs and the probability of decision errors (Capron and Shen, 2007). On the other side, high levels of information asymmetry, typical for lateral transactions, can lead to high bidding prices as well. This is because the buyer could have a greater potential for information gains in an acquisition of a company from an unrelated industry (Zhu and Jog, 2009; Achleitner et al., 2014).

In private equity research there is only one study analyzing the return effects of industry relatedness. This study is limited to venture capital trade sales. Trade sales are sales of portfolio companies to strategic buyers. Achleitner et al. (2014) investigate 716 venture capital trade sales and find that lateral sales generate higher returns for venture capitalists than synergetic sales. They further observe that return differences are higher in transactions of early ventures characterized by greater information asymmetries. This first study in the field of private equity confirms the role of relatedness as a differentiator of returns.

The circumstances in buyout-backed trade sales differ from those in venture capital trade sales or classical M&A transactions. Buyers in buyout-backed trade sales search for companies that have been optimized in profitability, efficiency and strategy over the course of a general partner's ownership. Those companies should offer the buyer interesting expansion or synergy potentials. Since buyout fund managers are investment professionals, specialized in value creation, their ownership can signal the quality of the target. In traditional M&A transactions there is usually no third party that focused on the optimization of the target the years before the transaction. The strategic objectives of buyers of venture capital backed companies differ as well, because they are interested in access to innovative teams or technologies. Those targets are often strongly growth oriented and may be not even profitable. But the circumstances in buyout-backed trade sales do not only differ because of different strategic acquisition objectives of the buyers; levels of information asymmetry between the parties differ as well. Concerning the degree of information asymmetry one can sort buyout-backed

trade sales between venture capital trade sales and traditional M&A transactions. Since venture capitalists sell very young companies, often active in young industries, information asymmetry is likely to be especially high. In buyout-backed trade sales there should be more information available about the companies to be sold, because they are by definition mature and established. In contrast to traditional M&A transactions, however, there should be less information available, because private equity firms are governed by few regulations and buyout-backed portfolio companies are usually not publicly traded.

These special situational conditions in buyout-backed trade sales suggest that the return effect of industry relatedness could be different compared to venture capital trade sales or traditional M&A transactions. Section 2.1 illustrates the high importance of the private equity asset class in the global economy. Of all buyout-backed exits, sales of portfolio companies to strategic acquirers represent the globally dominant exit channel (see Table 1-3). Despite this practical importance, there is little research about the return determinants in buyout-backed trade sales. To date there is no paper investigating the return effect of industry relatedness in buyout-backed trade sales. A better understanding of this research topic has practical and theoretical relevance.

3. Research approach and main findings

This dissertation contains two essays, each of which represents an independent academic contribution of its own. While the research questions in both essays are motivated by the return-driven private equity environment, their academic relevance result from different bodies of specific literature. The practical and theoretical relevance of both essays has been outlined in the previous sections. The titles of the essays reflect their respective research topics: (1) *style drifting in private equity: when are drifts implemented and how do they affect investment performance?* and (2) *the return effects of industry relatedness in buyout-backed trade sales*. The first essay sheds light on the investment practice of style drifting in private

equity. The second essay focuses on the return effects of industry relatedness in buyout-backed trade sales. For both research topics a quantitative research design is chosen. Table 1-1 presents a short overview of both essays.

The empirical analyses in this dissertation are based on the same general basis data. The initial sample of private equity investments was collected from three limited partners (fund-of-funds) during their due diligence processes directly from general partners. It comprises 26,881 unique private equity investments and contains general information on the fund manager-, fund- and deal-levels. Unique characteristics of this data are the large number of investments and thus the representative coverage as well as the incorporation of monthly gross cash flows at the portfolio company level (before carried interest and management fees). To meet the requirements of the specific research questions of Essays 1 and 2, further information on the general partner and portfolio company levels has been collected from four databases: ThomsonONE, Capital IQ, preqin and Pitchbook. This data was then matched with the initial proprietary data sample.

Out of the 26,881 private equity investments in the initial sample, Essay 1 uses a subsample of 12,426 investments executed by 340 general partners between 1971 and 2012. This is a subsample for which style drift important data could be collected.

The analysis of Essay 2 is focused on trade sales and uses buyer industry information. Since the initial data sample includes limited or no information about buyers, the missing data was searched in the databases. The collection of this information is challenging, because the data maintenance of exit dates and buyer information is rather bad and the content is differing among the different sources. In the end, the sample in Essay 2 comprises 656 buyout and 281 venture capital trade sales. Only for these exits could correct data matching be ensured.

Table 1-1: Essay overview

	Essay 1	Essay 2
Title	Style drifting in private equity: When are drifts implemented and how do they affect investment performance?	The return effects of industry relatedness in buyout-backed trade sales
Research questions	• What are the determinants of style drifting in private equity? • How do style drifts affect investment performance? • Do style drifts represent an agency problem between general and limited partners?	• Are there return differences of industry relatedness in buyout-backed trade sales? • What are the moderating factors of return differences of industry relatedness in buyout-backed trade sales?
Theoretical foundations/ concepts	• Style investing • Principal-agent theory	• Industry relatedness (in the context of M&A) • Asymmetric information theory
Methodology	Quantitative research design (multivariate pooled OLS regressions)	Quantitative research design (multivariate OLS regressions)
Sample and data structure	• 12,426 private equity investments • Unbalanced panel data	• 656 buyout-backed trade sales • Cross sectional data
Unit of analysis	General partner year (all transactions conducted by a unique GP in a specific year)	Trade sale
Dependent variable(s)	• Style drift score • PME • IM (appendix)	• PME • IRR (appendix) • IM (appendix)
Main results	• Determinants of style drifts: general partners' age, size and type, private equity competition and public market conditions • Positive impact of style drifts on the performance of buyout stage-oriented general partners • Positive interaction effect of private equity competition and style drift activity on the performance of buyout stage-oriented general partners	• Less industry relatedness between portfolio company and the buyer is favorable for the returns of selling general partners • Short investment durations, less experience of a general partner and unfavorable public market conditions lead to a pronouncement of return differences of industry relatedness in buyout-backed trade sales
Implications	• No agency conflict between buyout stage-oriented fund managers and limited partners related to style drifts • No significant relationship between style drifting and investment returns for venture capitalists found	• Better understanding of industry relatedness in the context of private equity trade sales (complement to existing literature) • Industry-wise unrelated buyers could be preferred by general partner in certain situations

Essay 1 investigates the determinants and performance implications of style drifts in private equity. Style drifts are analyzed on the general partner level as the intensity of change in a general partner's investment style over time. The essay connects this investment practice with a potential agency conflict between general and limited partners. The investigation incorporates buyout stage-oriented general partners and venture capitalists who invested in portfolio companies mainly in North America and Europe between 1971 and 2012. The investment style of a fund manager is defined by the industry, the geographical location and the development stage of the companies in her portfolio, as well as by the capital amounts invested in these companies. For the performance implications of style drifts, PMEs on the general partner level are investigated. This performance measure allows for a direct benchmark of private equity returns to public markets. Furthermore, a specific private equity competition variable is constructed that serves as a proxy for investment pressure in the market. To provide an answer to the question of potential agency conflicts related to style drifting, the interaction effect of style drift activity and competition on a general partner's performance is analyzed.

The essay identifies significant determinants of style drifting in private equity. It shows that experience and size of a general partner have a negative impact on her style drifting activity. Thereby, the age and the total invested capital of a general partner at the year of a respective investment serve as proxies for experience and size. Furthermore, the analysis finds that buyout stage-oriented fund managers tend to drift more than venture capitalists. Concerning market conditions the following insights are gained: First, there is some evidence that competition in the private equity market leads to more drifting activity. Second, public equity markets affect the drifting activities of general partners in such a way that they drift less during recession and more during boom periods. It is further found that style drifts significantly positively affect the performance of buyout fund managers. This finding suggests a certain diversification effect of style drifts. The positive performance effect of style

drifts is not found for venture capitalists. Finally, there is no evidence of an agency conflict between buyout fund managers and limited partners related to style drifts. The results of Essay 1 suggest that general partners drift to increase returns when competition in the private equity market is high. The interaction effect of competition and style drift activity on the performance of buyout stage oriented general partners is positive. This implies that fund managers opportunistically drift, based on superior information or market/business judgment.

This essay addresses conceptual and data-related issues by using a proprietary data sample that allows for a precise measurement of style drift activity and private equity performance. It provides novel evidence on the determinants and performance implications of style drifts in private equity and contributes to the question of a potential agency conflict between general and limited partners.

Essay 2 examines the role of industry relatedness on return differences in 656 buyout-backed trade sales. The triangle between a general partner as the seller, her portfolio company as the target and the strategic acquirer sets the frame for the investigation. Industry relatedness is measured between the buyer and the portfolio company. The essay sheds light on two underlying return drivers that are different for more- or less-related buyer companies: strategic acquisition objectives and levels of available information. It is assumed that the role of these drivers in buyout-backed trade sales differs from their role in venture capital trade sales or traditional M&A transactions. Furthermore, three moderating factors and their influence on return differences of industry relatedness in buyout-backed trade sales are analyzed: the investment duration of a general partner in the respective portfolio company, the experience of a general partner and the public market conditions at the time of the exit. Industry relatedness is measured according to an approach that is based on industry commodity flows information and Input-Output (IO) industry codes (Fan and Lang, 2000; Fan and Goyal, 2006). Returns are measured by PMEs like in the first essay.

It is found that buyout fund managers generate significantly higher returns in lateral compared with synergetic trade sales. Less industry relatedness between a buyer and a portfolio company seems to be an argument for higher bidding prices. The results suggest that lateral-specific acquisition objectives like market entry and information access outweigh synergetic-specific ones like market power and efficiency gains. The return difference between lateral and synergetic trade sales is pronounced when holding periods of the fund manager in the respective portfolio company are short, when the involved general partner is less experienced or when public market conditions are less favorable. It is shown that vertical and horizontal trade sales impact the return differences to lateral transactions differently under certain circumstances but not in general. The essay provides weak evidence that the influence of holding period and public market conditions on the return differences between lateral and synergetic trade sales stems from horizontal rather than from vertical trade sales. Further, the analysis shows weak support for the idea that the return difference in the case of less experienced general partners is driven more by vertical buyers and less by horizontal buyers. Overall, the essay enhances the understanding of the role of industry relatedness in investment returns in private equity trade sales. As the first research paper investigating this relation for buyout-backed trade sales it complements the findings of Achleitner et al. (2014) about venture capital deals.

II. Essays

1. Essay 1: Style drifting in private equity: When are drifts implemented and how do they affect investment performance?

Abstract

We assess the determinants, performance implications and potentially related agency conflicts of investment style drifts in private equity, using a unique dataset of 12,426 portfolio company investments by 340 fund managers. Our analysis overcomes existing limitations twofold. First, we use cash flow data for a precise performance measurement. Second, we employ a sophisticated measure of style drift. We find that experienced and large management firms drift less and that market conditions influence drift activity. Our performance investigation shows that style drifts have a significant positive impact on the performance of buyout but not venture capital fund managers, indicating a certain diversification effect of this investment practice. We further find that this performance effect is moderated by competition in the private equity market. Our conclusion is that buyout fund managers drift to improve returns when competition is high and consequently there is no agency conflict between buyout firms and limited partners based on style drifting.

Keywords: Private equity, buyouts, venture capital, investment style drift, style investing, public market equivalent

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1.1. Introduction

The dominant form of financial intermediation in the private equity[22] asset class is a closed-end limited partnership between private equity fund managers (general partners[23]) and institutional investors (limited partners). In the course of such a partnership, a general partner communicates an individual investment strategy, raises capital from convinced limited partners and starts to invest the collected capital in promising portfolio companies. The usual lifetime of a private equity fund is ten to thirteen years in which the limited partners are not allowed to withdraw their capital and the general partner has typically up to five years to deploy the capital and five to eight years to return it to the limited partners (Kaplan and Strömberg, 2009). If profits are generated, a substantial share are due to the general partner[24] (Axelson et al., 2009; Kaplan and Strömberg, 2009). While closed-end limited partnerships offer certain advantages in terms of setting the right incentives for general partners, they also come with potential agency conflicts (Axelson et al., 2009).

On the one hand, the main advantage of limited partnerships is that the compensation of the general partner is dependent on the performance of a bundle of investments (all investments of a fund), not just a single investment. Other than on a deal-by-deal consideration, in which the general partner may be incentivized to invest in too-risky or even bad investments due to her limited liability, the general partner should try to prevent an impairment of her portfolio performance due to a bad investment (Axelson et al., 2009). On the other hand, a limited partnership provides a general partner with substantial degrees of freedom. Once the capital from limited partners is raised, the general partner is typically not obligated to ask for any more investment permissions (Axelson et al., 2009). This state can be viewed as an agency issue in which the agent (general partner) is supposed to maximize the utility of the principals (limited partners). We assume that the utility of an investor is a function of risk and return. Since a limited partner takes her investment decision ex ante (Axelson et al., 2009), her main

[22] We use the term 'private equity' (PE) in a broad sense to include all stages of private equity investments from venture capital to buyout stages.
[23] Also referred to as GP, management firms, private equity firms and fund managers.
[24] Typically 20% of all gains beyond a predefined profit rate for limited partners (hurdle rate).

basis of decision-making is the predefined investment strategy of the private equity manager. This investment strategy (style) is defined by certain targeted portfolio companies' characteristics and the expected capital allocation to them. However, general partners frequently deviate from this strategy over time and occasionally invest in portfolio companies outside their ordinary style, thus "drifting" to a new style (Cumming et al., 2009; Bubna et al., 2015; Buzzacchi et al., 2015; Bain & Company, 2016). While style drifts are usually not appreciated by limited partners (Cumming et al., 2009; Buzzacchi et al., 2015), because they can overrule a crucial risk-taking decision, it remains unclear if they are beneficial in the described agency context. The downside for fund managers is obvious – they can lose their reputation with limited partners and, as a consequence, lose capital commitments in the future. However, there are several reasons for style drifts.

Starting with the ones that could indicate an agency problem, one motivation for fund managers could be the maximization of their own profits. Given the profit-related compensation systems in the private equity industry, managers could choose to drift to riskier investments to increase their probability of success. If there is high competition in the market, the drift decision could also reflect the inability of a fund manager to find attractive investment opportunities in the promised investment focus.

On the other side, there are also reasons to drift that could be in line with the interests of the limited partners. One benefit of style drifts could be a diversification of the overall portfolio of the general partner and her respective private equity fund (Langer et al., 2007). Further benefits of drifting activity could be found in the networks and the specialized knowhow of fund managers. They might have information about promising investment opportunities that the public market does not have and therefore they could opportunistically decide to drift from their ordinary investment strategies.

Gaining more clarity about the circumstances under which general partners decide to drift is scientifically and practically relevant. Especially, the question of whether there is an agency conflict between general and limited partners based on this investment practice is interesting. But a better understanding of private equity style drift does not end with the explanation of

the determinants. The performance implications of drifting activity are just as essential, especially to limited partners.

Despite the apparent practical relevance of this topic, there is only sparse academic literature about the motivations for and implications of style drift in private equity. The discussion of how style drifts affect the performance of general partners is still at its beginning. To the current state of knowledge, there are just three papers on this specific topic (Langer et al., 2007; Cumming et al., 2009; Bubna et al., 2015). Interestingly, the results are contradictory. Langer et al. (2007) and Cumming et al. (2009) report a positive effect of style drifts on investment performance, while Bubna et al. (2015) present evidence for the opposite. This lack of consensus could be based on the deviating level of analysis of Bubna et al. (2015). They restrict their investigation to venture capitalists. Furthermore, existing research struggles with limitations of data availability and measurement accuracy. First and foremost, there are several dimensions of style drifting that previous research does not cover[25]. There is a consensus that investment style is defined by the industry, the geographic location and the development stage of the companies in a general partner's portfolio, as well as by the capital amounts invested in these companies (Sahlman, 1990; Langer et al., 2007; Cumming et al., 2009; Buzzacchi et al., 2015). Langer et al. (2007) and Cumming et al. (2009) constrain their analyses to drifts in portfolio companies' development stages, ignoring the other components of investment style. Second, there are several ways to measure performance that have not been considered in the context of private equity style drifts. Researchers have traditionally used absolute measures of private equity performance such as the internal rate of return (IRR) and the investment multiple (Harris et al., 2014). However, recent research increasingly uses the Public Market Equivalent (PME) as a measure of private equity performance (e.g. Kaplan and Schoar, 2005; Harris et al., 2014; Sorensen and Jagannathan, 2015; Braun et al., 2017). This measure allows for a direct benchmark of private equity investments to public markets and has not been used in style drift analyses so far. Based on data limitations, Cumming et al.

[25] Besides Bubna et al. (2015).

(2009) and Bubna et al. (2015) only use performance proxies[26] instead of the described measures. They both state that detailed cash flow information would be useful to accurately analyze performance implications. In sum, the research lacks a comprehensive analysis of style drift and performance.

In this paper, we are able to address some conceptual and data-related issues by using a proprietary sample of 12,426 unique buyout and venture capital investments executed by 340 general partners between 1971 and 2012. The data contains information useful for the analysis of determinants and implications of style drifts. First, the data includes monthly gross cash flows between general partners and their portfolio companies (before carried interest and management fees). This level of detail enables us to calculate PMEs, while not being limited to performance proxies. For the calculation we use regional MSCI total return indices that lead to a risk-adjusted performance measurement. This performance comparison to investments in public markets best suits the agency discussion between limited and general partners. Second, we have information about the industry, the geographical location and current development stage of each portfolio company. Based on these three factors, weighted by the invested capital, we calculate style drifts precisely. Our applied measurement of style drift activity was developed by Bubna et al. (2015); it overcomes the limitation to stage drifts used in existing literature.

The first part of our empirical analysis sheds light on the determinates of private equity style drifts. Our key variable is a style drift score calculated yearly at the general partner level[27]. We find significant negative effects of private equity management firms' experience (measured by age) and size (measured by invested capital) on their style drift activities.

[26] Cumming et al. (2009) use the type of exit as a performance proxy. IPOs are considered as successful exits and all other types of exits (e.g. trade sales) as unsuccessful. Bubna et al. (2015) use the exit likelihood and the time-to-exit as performance proxies. Successful exits include IPOs, mergers and acquisitions and secondary sales.

[27] This score (*GP Drift Score*) is calculated on the basis of general partner-specific style proportion vectors that are built on current and past investments (four years), assigned to pre-defined investment styles and weighted by invested capital. The distance between style proportion vectors from year to year implies the degree of style drift (Bubna et al. (2015).

Concerning the experience effect, our explanations are as follows: First, we confirm Langer et al.'s (2007) argument that old general partners may use their reputations and networks to find promising investment opportunities within their ordinary investment foci, and thus lower their need to drift. Second, low experience could also lead to a low ability of fund managers to identify attractive targets within their home turfs, thus forcing them to drift. Our third explanation connects the experience of a general partner with her size. Because old/experienced general partners are often also large in size[28], they regularly have diversified portfolios. To trigger style drift activity, they need to move substantial capital from one style to another or invest high amounts in a completely new style. Due to their size, they could be more diversified and thus less prone to drifts.

Further, we find evidence that general partners focused on buyout stage investments[29] tend to drift more than fund managers specialized in venture capital investments[30]. Since venture capitalists normally practice very active management of their portfolio companies and are highly specialized in certain areas (Manigart et al., 2006; Achleitner and Braun, 2010), they may be more restricted within their investment foci.

Besides the impacts of general partners' characteristics, we also analyze the effects of the private equity industry and public market conditions on style drifts. We find some evidence for more drifting activity when competition in the private equity market is high. Since our competition variable is based on raised capital, this indicates that fund managers could have problems finding suitable investment opportunities when levels of dry powder [31] and investment pressure are high. This interpretation is in line with existing research (Gompers and Lerner, 2000; Ljungqvist and Richardson, 2003b; Langer et al., 2007). The fact that capital commitment in private equity funds is time limited could also put pressure on fund managers to invest their dry powder before funds' lifetimes end (Langer et al., 2007). A

[28] There is a positive correlation (at the 1% significance level) between the total invested capital that a general partner has spent from the first investment year to the current year of investment (*GP Invested Capital to Inv.*) and her age in the current investment year (*GP Age*).

[29] We use the terms buyout stage oriented general partner, buyout fund manager, buyout firm and buyout stage oriented fund manager for this type of general partner.

[30] We use the terms venture capitalist, venture capital general partner and venture capital firm for this type of general partner.

[31] Dry powder = cash available for investments.

tendency to drift under high competition becomes more and more relevant, as the private equity industry has registered increasing capital inflows and record levels of dry powder in the past years (Bain & Company, 2016). Concerning the effects of public market conditions, we observe that fund managers tend to stick to their investment home turfs in recession years and feel confident investing outside them in boom periods. One reason for this phenomenon could be that in boom periods, when favorable public market conditions such as increased investment opportunities are obtained (Audretsch and Acs, 1994; Gompers and Lerner, 2004; Langer et al., 2007), fund managers are tempted to invest in new areas.

In the second part of our empirical analysis, we investigate the performance implications of style drifts. We find significant evidence for a positive impact of style drift activity on the performance of buyout stage oriented general partners. Our results are consistent with and extend the findings of Langer et al. (2007) and Cumming et al. (2009). For venture capital firms, we find no such significant relationship. This is in line with our finding that venture capitalists drift less than buyout firms.

Turning back to the performance implications of style drifts of buyout firms, our investigation suggests that buyout managers mostly drift because they are able to identify attractive investment opportunities. This also fits in the context of portfolio management theory, in which active portfolio management is necessary to ensure adequate returns within relatively long private equity investment horizons (Langer et al., 2007). Since our investigation is at the general partner level, our results further suggest a positive diversification effect of style drifts. However, this does not imply an unconditional benefit for limited partners, as style drifts change the risk and return profiles of their investment portfolios in any case. To shed more light on the potential agency issue between general and limited partners we try to differentiate between opportunistic drifts and drifts by necessity. Opportunistic drifts would not imply an agency conflict. In these cases, we assume that fund managers have insider information or superior market/business judgment, which lead them to their drift decisions. In contrast, drifts under pressure could indicate an agency problem. Such drifts happen when fund managers are

not able to find attractive targets within their investment foci because of high competition in the private equity environment. We assume that drifts by necessity can lead to an unexpected increase in risk or lower returns. To clarify this question, we test whether there is an interaction effect of private equity competition (as a proxy for investment pressure) and style drift activity on the performance of general partners. We find a significant positive effect of style drifts on general partners' PMEs when competition is high. Additionally, we find some evidence for a positive interaction effect. Consequently, we argue that the incentives for buyout firms work so that fund managers do not invest outside their investment foci when this implies inferior returns to limited partners. In summary, our analyses suggest that there is no agency conflict between buyout stage oriented general partners and their investors related to style drifts.

The remainder of this paper is structured as follows: Section 1.2. explains the methodology of our style drift measure and defines our performance measurement. Section 1.3. presents our data sample, variables and descriptive statistics. In Section 1.4., we analyze and discuss the determinants of style drift activity and the performance implications of style drifts. We further elaborate the question if there is an agency issue between general and limited partners based on style drifts. Section 1.5. concludes the paper.

1.2. Methodology

1.2.1. Definition and measurement of style drift

We define style drift as the intensity of change of the ordinary investment focus of a general partner over time. The investment focus is determined by the characteristics of companies in the portfolio of the general partner weighted by the invested capital in the respective companies. Style-important characteristics are industry, geographic location and the portfolio

company's development stage (Sahlman, 1990; Langer et al., 2007; Cumming et al., 2009; Buzzacchi et al., 2015).

The method of style drift measurement in the context of private equity applied in this paper was developed by Bubna et al. (2015). It differentiates itself from other approaches in several ways.

First, style drift decisions are defined as active decisions made at a general partner level. Every change concerning the investment focus of a general partner, no matter if this change happens within a specific fund or from fund to fund, represents an active drift decision (Bubna et al., 2015). Alternatively, one could analyze style drifts at a fund level (Cumming et al., 2009). However, we think the general partner level is more accurate, as investment decisions are often made by an investment committee at a general partner level (Bubna et al., 2015; Braun et al., 2017).

Second, the measure incorporates the main investment criteria that define the investment style of a private equity investor and is therefore very precise. Previous analyses detect style drifts by comparing the general partner's pre-stated focus in a specific development stage of potential investments (e.g., buyout vs. venture capital) and the actual development stage of a portfolio company in which the general partner subsequently invested (Langer et al., 2007; Cumming et al., 2009). While the portfolio company's development stage is an important differentiator, the geographical location, the industry and the amount of invested capital are also characteristics defining investment style (Sahlman, 1990; Langer et al., 2007; Cumming et al., 2009; Buzzacchi et al., 2015). The approach used in this paper takes into consideration all key characteristics of investment style – namely, industry and geographic location, the portfolio company's development stage and deal size.

Third, the measurement compares each investment activity of a general partner to its ordinary investment focus. This means that it is based on real drifting activity and is not liable to reporting errors. It detects drifts from the ordinary investment focus of a general partner and not from a pre-stated investment strategy. A good example would be a rather generalist fund

manager. For the purpose of fundraising, she communicated her investment strategy to potential investors (limited partners). She stated she would invest in fairly established (buyout stage) companies. After the fund was closed, this general partner invested exclusively in the German automotive supplier industry. Some years later, she invested in a US-based DIY-chain. If we detected style drifts by comparing actual investments to the pre-stated investment strategy of this general partner, we could not classify this investment as a drift activity because the general partner did not define any industry or geographical focus earlier. Since our hypothetical general partner only has investment experience in the German automotive supplier industry, we would classify the move to the US DIY industry as a style drift. Therefore, we measure drifting activity using the real investment activity of a general partner, not an often broad, pre-stated investment focus.

Based on these portfolio company-specific characteristics, we define investment style categories. For the industry allocation of a specific portfolio company, we use the 10 industry categories from the globally established Industry Classification Benchmark (ICB) from FTSE Russell. Geographically, we differentiate between North America, Europe and the rest of the world. Last, we distinguish between portfolio companies' development stages – more precisely, we segment portfolio companies in which the general partner invested during early development stages (venture capital) and companies in which she invested during later development stages (buyouts)[32]. Based on these three portfolio company characteristics, we define 60 possible investment styles (10 industries x 3 geographical locations x 2 development stages). Our categorization of investment styles deviates from Bubna et al.'s (2015) concerning the concrete definition of style characteristics. Bubna et al. (2015) employ 20 different styles, based on six different industries, three regions and two development stages of portfolio companies (buyout vs. non-buyout). 18 of their 20 styles are specifications of

[32] We define venture capital as investments in seed, early and expansion stages; buyout stages are matched with later stage, small/mid/large capital and listed-security investments.

non-buyout transactions and only two styles differentiate buyout stage transactions[33]. Our 60 style categories allow for a far more precise measurement of style investing including an equal specification level between buyout and venture capital transactions (two times 30 styles). Our level of style differentiation is based on the private equity investment varieties in reality. Covering the key industries, regions and investment stages, we avoid a too-narrow measurement which would lead to unrealistic levels of style drift. Please see Section 1.6.1. (appendix) for a detailed list of our styles.

After defining the 60 style categories, we allocate each investment to one of these styles. The subsequent technical procedure to measure style drift activity is based on Bubna et al. (2015). As a result, we get a general partner-specific investment style vector that contains the number of styles in which the general partner is invested (Bubna et al., 2015). Because the amount of money invested in different portfolio companies has to be considered as well, we calculate style proportion vectors (Bubna et al., 2015). Following Bubna et al. (2015) we denote them as $P_{jt} = [P_{j1t}, P_{j2t}, \ldots, P_{j60t}]'$. P_{jt} demonstrates the year-specific investment style proportion vector for a unique general partner, in which all her investments in a specific style 1-60 are weighted with invested capital. The style drifting activity is measured as a change of the investment style from year to year. We do just consider initial investments (not follow-on investments), as they reflect the real investment style decision. Furthermore, investment strategies are long-term oriented – consequently, it does not make sense to compare the changes in investment style based on just 2 years. We use a style observation period of 4 years that reflects the median holding period of portfolio companies in our sample (compare with Section 1.3.). This means that an investment made in year *t* influences the investment style of the respective general partner until year *t+3*. We do not consider exits during this time (Bubna et al., 2015) because we concentrate on active style investing activities. Consequently, we cumulate investment amounts per general partner, starting with the current investment year and rolling three years back. On the one hand, we cumulate capital invested

[33] For clarification: Bubna et al. (2015) analyze style drifts on a general partner level for venture capitalists. On a deal level they also include the buyout development stage. However, they only distinguish between two different buyout styles.

in specific styles and, on the other hand, total capital invested by each general partner (Bubna et al., 2015). The cumulated capital in a specific style divided by the cumulated total invested capital of a unique general partner gives us the style proportion vector of this specific style for this unique general partner in a given year. As a result, we get style proportion vectors (P_{jt}) that incorporate four years of investment information (the current and past three years) and add up to one for each general partner year. Further, following Bubna et al. (2015), we define the style drift score for general partner j "from one year to the next as one minus the cosine similarity between consecutive years' style vectors" (Bubna et al., 2015, p. 5):

$$\text{Style drift score} = d_{jt} = 1 - \frac{P_{jt} \cdot P_{j,t-1}}{\|P_{jt}\| \times \|P_{j,t-1}\|} = 1 - \cos(\theta) \in [0,1] \quad (1)^{34}$$

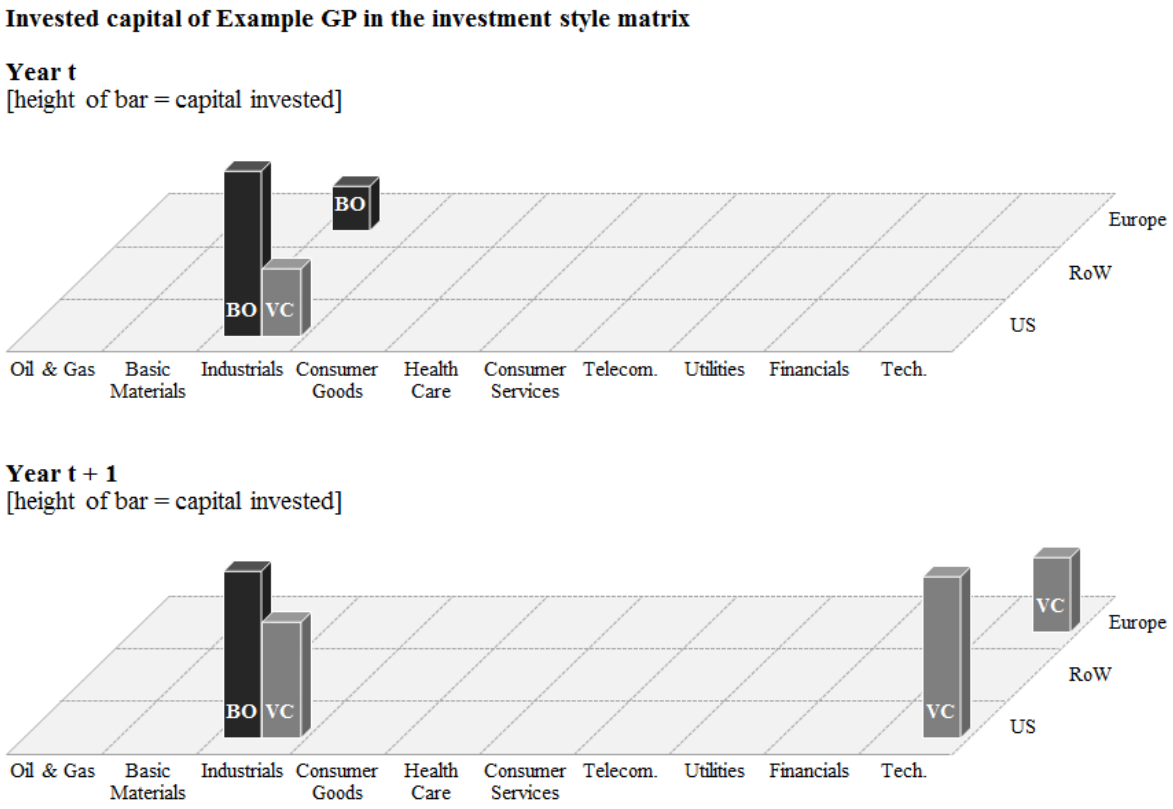
"where θ is the angle between P_{jt} and $P_{j,t-1}$, the numerator is a dot product, and the denominator is the product of two style vector norms" (Bubna et al., 2015, p. 5). Since the style drift score measures a yearly change in investment style, it is not calculable for the first investment year of a general partner. Its values lie between 0 and 1 per definition (Bubna et al., 2015).

Figure 2-1 shows a simplified graphical representation of a style drift. We see the investment allocation of a hypothetical general partner in our investment style matrix in two consecutive years (t and t+1). There are bars in different colors on a grid with the dimensions industries and regions. The color of a bar stands for buyout or venture capital investments and the height for the capital amount invested. In year t of this example the general partner is invested in portfolio companies in the industrials industry which are based in the US or Europe. The portfolio companies operate in different development stages (buyout and venture). However, the focus of the general partner is in buyout investments, which is demonstrated by the height of the bars. In year t+1 she drifted her investment style. Now, her portfolio consists predominantly of venture capital investments. Furthermore, she disinvested in industrials in Europe and invested in venture investments from the technology sector in the US and Europe.

[34] Formula is based on Bubna et al. (2015), p. 5.

In summary, this change in the allocation of capital to portfolio companies from different industries, regions and development stages demonstrates a style drift.

Figure 2-1: Style drift example [simplified]



(own illustration)

Please note that this example is for the sole purpose of illustration. For further clarification of this measurement, please see Section 1.6.2. (appendix), which provides an detailed application example (or Bubna et al., 2015).

1.2.2. Performance measurement

Absolute measures of private equity performance traditionally used are the internal rate of return (IRR) and the investment multiple (Harris et al., 2014). However, these measures have some drawbacks. Starting with the IRR, there are three major issues. First, the IRR does not consider any risk adjustments, or more specifically, two investments with the same timing and

amount of cash contributions and distributions always have the same IRR no matter which one is riskier. Second, the IRR ignores market developments. Third, the IRR is prone to timing. That means that the IRR is not appropriate for comparing investments in portfolio companies or funds with different holding periods or timing of cash flows. The last point is also the reason the IRR is easy to manipulate, if general partners choose the amount and time of an investment in a respective way (Sorensen and Jagannathan, 2015).

The investment multiple (IM), the other traditional measure, is easy to calculate and provides a quick intuitive evaluation of private equity performance. At a portfolio company level, it is the sum of all proceeds from dividends and from the sale of the company at the end of the holding period[35] divided by the total capital paid in by the general partner[36]. But like the IRR, the investment multiple does not adjust for risk and does not consider market developments. Other than the IRR, the investment multiple ignores the time value of money. This fact makes the measure less prone to manipulation but also steals its expressiveness.

Recent research increasingly uses the Public Market Equivalent (PME) as a measure of private equity performance (e.g., Kaplan and Schoar, 2005; Harris et al., 2014; Sorensen and Jagannathan, 2015; Braun et al., 2017). The main reason for the popularity of this measure is that it allows for a direct benchmark of private equity investments to pubic markets. This comparison is especially interesting for limited partners and often superior to IRR or investment multiple considerations. Given a bullish market environment, for example, an IRR of +20% or higher can still represent a smaller return than a return generated by an investment in the public market. Consequently, the PME is superior to other private equity performance measures, because it incorporates the opportunity cost comparison with investments in the public market and is "robust to manipulation" (Sorensen and Jagannathan, 2015, p. 48). As mentioned by Sorensen and Jagannathan (2015), there are also limitations of the PME: First, the measure is appropriate for ex-post performance analyses and not suitable for forecasts. Second, the measure does not incorporate any illiquidity considerations, which could be

[35] In the case of partially realized investments, some returns were already generated; the value of further expected proceeds is estimated by general partners.

[36] The same calculation is possible at a fund or general partner level considering all investments of the fund/ general partner.

important in the evaluation of a limited partner's general asset class allocation (Sorensen et al., 2014).

Based on the described advantages of the PME, we use it as our primary performance measure. The investment multiple serves as a robustness check of the performance implications (results are documented in Section 1.6.3. [appendix]).

1.3. Data and statistics

1.3.1. Sample description

We collected information from a large number of private equity investments from three limited partners (fund-of-fund managers) that received the data during their due diligence processes directly from general partners. This collection process minimizes the threat of selection bias, as general partners reveal their complete track record of all past investments and the data comprises information from all the general partners who participated in a due diligence process, not only those in which the fund-of-funds finally invested. Besides general fund and deal-level information, the data contains monthly gross cash flows at the portfolio company level (before carried interest and management fees). This degree of detail allows for a very precise analysis of performance effects. After receiving the data from the fund-of-funds, we merged them and deleted double counts. In a next step, we collected missing information from Capital IQ, preqin and Pitchbook.

Beginning with an initial sample of 26,881 investments, we deleted investments for which important information was missing. The most essential information is the industry, geographical location and development stage of the portfolio company as well as detailed cash flows between the general partners and their investments. We also deleted transactions conducted by general partners who specialized in fixed income or special situations or declare themselves generalists. Finally, we excluded unrealized investments from our analysis, as

they contain unreliable information, especially in the context of performance analyses (Langer et al., 2007; Puche et al., 2015). After this adjustment process, our final sample consists of 12,426 unique private equity investments executed by 340 general partners between 1971 and 2012.

In Table 2-1, we show the composition and characteristics of our sample in detail. We divide the sample into five panels differing in respect to realization status and our style criteria of industry, geographical location and development stage as well as different time periods. The sample of 12,426 investments shows the median investment year to be 1999 and the median holding period of 4.3 years per investment. The median amount that general partners invested per investment is USD 9.2 million and the median PME[37] 1.3. This indicates that private equity investments outperformed public markets. Panel A divides the sample into 2,987 (24%) partially realized and 9,439 (76%) fully realized investments. Partially realized investments already generated some return and therefore represent reliable information for performance implications. Panel B shows the segmentation of the sample into 8,517 (69%) buyout and 3,909 (31%) venture capital investments. Looking at the median PMEs, buyout investments seem to outperform public markets more strongly than venture capital transactions. Panel C illustrates the geographical spread of our sample – 52% of all transactions were conducted in North America, 40% in Europe and 8% in the rest of the world. Although most investments were placed in the US, our data set still allows for valuable predictions about private equity investments outside the US, geographical coverage that is demanded in private equity research (Braun et al., 2016).

[37] A PME of 1 implies that the private equity return equals the return in the respective market index. A PME < 1 implies an underperformance and a PME > 1 an outperformance of the private equity investment.

Table 2-1: Sample composition and characteristics at the deal level

Table 2-1 shows information about the 12,426 unique private equity investments in our sample. We report median values for investment year, holding period, total capital invested in millions of USD and PMEs. The PME values are winsorized at the 97th percentile and are calculated in comparison to regional MSCI indices. Panel A separates partially realized from fully realized transactions. Panels B-D mirror our investment style characteristics. Panel B divides the sample of investments in buyout and venture portfolio companies. Panel C categorizes the investments according to the geographical location of portfolio companies' headquarters and Panel D shows the respective industry (according to ICB). In Panel E the transactions are allocated to different time periods, measured by investment year (based on Kaplan and Strömberg, 2009; Braun et al., 2017).

			Median			
	Obs. #	Obs. %*	Investment year	Holding period [yrs]	Total capital invested [m USD]	PME**
All deals	12,426	100%	1999	4.3	9.2	1.3
Panel A: Realization status						
Partially realized	2,987	24%	2004	4.3	23.3	1.4
Fully realized	9,439	76%	1998	4.3	6.9	1.2
Panel B: Development stage						
BO	8,517	69%	2000	4.3	14.6	1.5
VC	3,909	31%	1999	4.2	4.4	0.7
Panel C: Region						
North America	6,491	52%	1998	4.5	8.3	1.2
Europe	5,003	40%	2000	4.2	9.8	1.4
RoW	932	8%	2002	3.7	14.2	1.5
Panel D: Industry (ICB)						
Oil & Gas (0001)	110	1%	2003	3.5	26.0	2.1
Basic Materials (1000)	199	2%	2000	4.3	14.7	1.6
Industrials (2000)	2,794	22%	1999	4.3	12.3	1.5
Consumer Goods (3000)	1,525	12%	2000	4.5	14.3	1.4
Health Care (4000)	1,847	15%	1998	4.8	5.7	1.2
Consumer Services (5000)	1,534	12%	1999	4.3	15.1	1.4
Telecommunications (6000)	965	8%	1999	4.0	7.6	1.0
Utilities (7000)	163	1%	2000	3.8	12.6	1.6
Financials (8000)	530	4%	2000	3.9	18.7	1.5
Technology (9000)	2,759	22%	1999	4.0	5.5	0.9
Panel E: Time categories						
1971-1989	1,010	8%	1986	6.0	1.5	0.9
1990-1994	1,707	14%	1993	5.0	3.0	1.2
1995-1999	3,934	32%	1998	4.8	6.9	1.2
2000-2004	3,691	30%	2001	4.3	13.8	1.4
2005-2012	2,084	17%	2006	2.8	36.9	1.5

* Percentage values may not add up to 100% due to rounding

** PME values are calculated in comparison to regional MSCI indices

Panel D demonstrates the industrial range of the observed portfolio companies, thus the industrial orientation of private equity investments in our sample. According to the Industry Classification Benchmark (ICB) from FTSE Russell, we observe the following spread: 22% technology, 22% industrials, 15% health care, 12% consumer services, 12% consumer goods, 8% telecommunications, 4% financials, 2% basic materials and 1% utilities and oil & gas each[38]. Concerning the median PME in this panel, it is interesting that the industries that caused the most profitable investments (oil & gas, basic materials, utilities, financials) are not the ones in which most investments were placed. In fact, the least profitable industry sector technology was one of the most invested in (22 % of all investments). Panel E illustrates the broad observation time of our sample. The observed transactions took place between 1971 and 2012 and are clustered based on the time categories applied by Kaplan and Strömberg (2009) and Braun et al. (2017). It is shown that the median holding periods have become shorter and the median investment amounts have become bigger.

The focus of our analysis is a general partner year (GP year), which includes all investments of a general partner in a specific year. The 12,426 unique investments were made by 340 general partners in 2,799 GP years. Table 2-2 shows descriptive information about the sample at a general partner level. At the median, management firms (general partners) were founded in 1993, invested about USD 287 million in 19 portfolio companies, generated a PME of 1.9 and showed a drift score of 0.13. Panel A shows that 76% of all general partners are declared as buyout stage oriented and 24% as venture capital focused. This separation is very useful for research, because it allows for distinct and separate analyses of both areas of private equity. Buyout fund managers reached a median PME of 2.0. This confirms existing research that finds an outperformance of buyout funds against public markets as well (Ljungqvist and Richardson, 2003a; Robinson and Sensoy, 2011; Harris et al., 2014). The median PME of 1.6 for venture capitalists in our data also suggests an outperformance of public markets, but to a lower extent than buyout firms. The median style drift score of buyout stage oriented general

[38] Percentage values do not add up to 100% due to rounding.

partners is higher than that of venture capitalists. Furthermore, Panel B shows that our sample is very balanced concerning the regional footprint of general partners; approximately half of them are US-based and half have their headquarters outside the US. This separation makes it easier to compare our sample with other research, which is often only focused on US funds/general partners. Furthermore, Panels C and D divide the general partners concerning their age and size, characteristics of special interest in private equity research in the context of style drift activity (Langer et al., 2007; Cumming et al., 2009; Bubna et al., 2015; Buzzacchi et al., 2015). The differences in the drift scores indicate that relatively young and small general partners drift more and vice versa.

We believe that our data sample depicts private equity activities accurately and that valuable conclusions can be drawn from it. The main unique characteristics are the large number of transactions, the long observation period of more than 40 years and the comprehensive information available per investment, including crucial information like gross cash flows.
Nevertheless, there is potential for bias in our data sample. Although we work with a large number of transactions, the sample does not cover all actual private equity transactions that have been conducted. However, the threat of this selection bias seems small because the descriptive statistics of our sample show characteristics similar to those of other representative data sets.

Table 2-2: Sample composition and characteristics at the general partner level

This table provides information about the 340 general partners (GPs) in our sample. The table shows medians of founding year, number of total deals implemented and total capital invested in millions of USD at the GP level. We further show GP PMEs aggregated from single transactions weighted by invested capital and winsorized at the 97th percentile. They are calculated in comparison to regional MSCI indices. The last column shows median GP style drift scores. Again, the values are based on averages calculated at the GP-level. The drift score values represent the information of only 324 GPs, because the scores cannot be calculated for GPs with only one investment year. Panel A categorizes the GPs by private equity type (self-reported), Panel B by region, measured by GPs' headquarters location, Panel C by age and Panel D by size, measured by total capital invested in millions of USD.

			Median				
	Obs. #	Obs. %*	Year founded	# of deals	Total capital invested [m USD]	GP PME**	GP drift score***
All GPs	340	100%	1993	19.0	287.2	1.9	0.13
Panel A: PE Type							
BO	258	76%	1993	18.5	357.9	2.0	0.13
VC	82	24%	1994	25.5	125.3	1.6	0.12
Panel B: Region							
US-based	161	47%	1990	24.0	378.5	2.0	0.12
Not US-based	179	53%	1994	17.0	212.2	1.8	0.13
Panel C: Age							
Founded 1965-1989	130	38%	1984	38.5	670.9	1.9	0.10
Founded 1990-1999	153	45%	1995	16.0	235.9	1.9	0.14
Founded 2000-2007	57	17%	2002	6.0	123.9	2.0	0.14
Panel D: Size							
1st quantile total cap. inv.	85	25%	1997	6.0	35.5	1.9	0.17
2nd quantile total cap. inv.	85	25%	1995	15.0	172.2	2.0	0.14
3rd quantile total cap. inv.	85	25%	1990	22.0	475.4	2.0	0.13
4th quantile total cap. inv.	85	25%	1988	54.0	3,047.9	1.7	0.09

* Percentage values may not add up to 100% due to rounding ** PME values are calculated in comparison to regional MSCI indices *** 16 GPs with only one investment year not included (no drift score available)

1.3.2. Description of variables

Style drift score

As described in Section 1.2.1, we calculate style drift scores based on the approach of Bubna et al. (2015) for every general partner for each investment year. The score represents the magnitude of drift activity of one general partner in a specific general partner year, compared to her investment portfolio composition of the last four years. Four years is the rounded median holding period of our whole sample of 12,426 investments. The style drift score is

normalized and takes values between zero and one, in which zero implies no and one maximum drift activity. We name the variable *GP Drift Score*.

Public Market Equivalent (PME)

Based on the considerations in Section 1.2.2, we use the PME as our performance measure. More precisely, we use the PME measure developed by Kaplan and Schoar (2005) defined as the sum of all cash outflows (distributions = dist) discounted by the respective market index return (r_M) divided by the sum of all cash inflows (calls = call) discounted also by the same market index return (Kaplan and Schoar, 2005).

$$PME = \frac{\sum_t \frac{dist(t)}{1+r_M(t)}}{\sum_t \frac{call\ (t)}{1+\ r_M(t)}} \qquad (3)^{39}$$

For our calculation, we take the cash flows between the general partners and their portfolio companies (before any deductions for carried interest and management fees) and discount them by regional MSCI total return indices.

We winsorize PMEs at the investment level at the 97th percentile. To get PMEs at general partner year level, we weight the measure by total invested capital per investment in a certain year. The resulting variable is called *GP PME*.

Explanatory variables

To control for potential management firm experience effects, we incorporate the age of a general partner (*GP Age*) measured in years as an explanatory variable. This variable is calculated as the difference between the investment year and the founding year of a general partner plus 1.

Another potential factor of influence is firm/general partner size. We measure size as the total invested capital in millions of USD (*GP Invested Capital to Inv.)* that a general partner has spent from the first investment year to the current year of investment. For the descriptive

[39] Formula is based on Sorensen and Jagannathan (2015).

statistics, we use the total invested capital of a general partner over the whole observation period.

We also include dummy variables for the type and region of private equity investors. Concerning the type, we distinguish between buyout-stage-oriented and venture capital general partners (BO = 1; VC = 0). This information was mostly self-reported by the general partners to the fund-of-funds. Missing data is from Pitchbook. We call this variable *GP Type*. Concerning the region, we divided the sample of general partners by their headquarters' location. The dummy variable (*GP Not US-Based*) equals one if the headquarters is located outside the US[40].

Since there is increasing competition in the private equity industry, we incorporate a *Competition* variable. Rising amounts of capital flowing into private equity funds and an already high level of dry powder (Bain & Company, 2016) are indicators of growing competition and investment pressure. These circumstances could influence investment style decisions and the performance of general partners. Our *Competition* variable measures raised capital by a rolling calculation over four years and normalizes this amount with a GDP figure. The variable differentiates between capital raised by venture capital and buyout funds as well as between the geographical markets in which this capital was raised (North America, Europe, Asia). The normalization is conducted using the respective regional GDP. Consequently, we can control for higher or less intense competition for a specific general partner in every investment year[41].

To control for general financial market conditions, we include two more variables, both based on the average MSCI world performance index per year. We calculate the percentage change from year to year and define two dummy variables, one for boom and one for recession periods. The *Recession Indicator* equals one if the yearly MSCI world average in a specific year was more than 5% lower than the average value one year before, and zero otherwise. This variable identifies the following years as recession years: 1974, 1982, 2001, 2002, 2008 and 2009. The *Boom Indicator* equals one if the yearly change in the MSCI world average

[40] We restrict the differentiation in the variable to US vs. Not-US, because we have a minor share of GPs that are located outside the US or Europe in the sample.

[41] Due to data constraints, the variable is only calculated for the years 1980-2011.

was greater than +20%. The years 1972, 1977, 1983, 1985-1987, 1999, 2004 and 2010 are classified as boom years. Consequently, the reference year for both public market condition dummies is a normal year in which no boom or recession was identified.

1.4. Empirical results and discussion

In this section, we present multivariate empirical analyses to test under what conditions drifts are implemented and how they affect investment performance. Our data structure is an unbalanced panel with year and firm (general partner) dimensions. The unit of analysis is a general partner year (GP year) that includes all investments of every active general partner conducted in a given year (GP firm x investment year).

1.4.1. What are the determinants of style drifting in private equity?

Table 2-3 provides pooled OLS regressions of determinants of style drift activity (*GP Drift score*). We show seven models. Models 1 and 2 analyze the isolated effects of general partners' experience and size in the full sample of 2,799 GP years (including 12,426 unique investments made by 340 general partners). Models 3-7 include all the explanatory variables described above. Here, the sample size is only 2,784 GP years (including 12,376 unique investments made by 340 general partners) because of the incorporation of the *Competition*[42] variable. To reach robust results, we conduct alternative specifications. Models 1-5 estimate standard errors using Huber-White sandwich estimators (Huber, 1967). Model 4 further includes time-fixed effects at a year level. Model 5 incorporates firm-fixed effects at a general partner level in addition to time-fixed effects. Since we analyze unbalanced panel data (GP firm x investment year), residuals could be correlated across years or general partners, hence could not be independent. In this case OLS and Huber-White standard errors would be biased (Petersen, 2009). Because we expect firm and time effects in our data, we include two more

[42] Based on data constraints the variable is only calculated for the years 1980-2011.

Models (6-7) to ensure unbiased estimates and the robustness of our results. Following Petersen (2009), the first option for doing so is to calculate an OLS regression with clustered standard errors at the general partner level and, further, to include year dummies (Model 6). The second option is a two-way clustering on firm and year effects (Model 7) (also suggested by Cameron et al., 2011; Thompson, 2011).

Since our *GP Drift Score* variable is right-skewed, we correct for this skewed distribution using the natural logarithm transformation of the variable. Narrowing the range of the drift variable is useful, as moderate style drift activities are very common in private equity and we are especially interested in nuances of more drift starting at a rather low level. As our *GP Drift Score* variable contains values equal to zero (and, in the maximum, equal to one) we take the natural logarithm of (1+ *GP Drift Score*) for our analysis[43].

Model 1 analyzes the isolated effect of *GP Age* on style drift activity. We use the age of a general partner as a proxy for her experience (Cumming et al., 2009; Bubna et al., 2015). As learning curve effects decrease with time, we use the natural logarithm of *GP Age* in our regression. The negative effect of age/experience on style drift activity is significant at the 1% significance level. The significance persists in Model 4 at the 1% and, in Models 3, 6 and 7, at the 5% significance level, controlling for other influence factors of drift activity. Model 1 estimates that a 50% increase in age would lead to a -1.2% decrease in style drift activity (Wooldridge, 2009). Although statistically significant, the economic significance seems modest. Since analyzed general partners show a wide range of years of experience (2-46), the impact is interesting at least in the comparison of very young to rather old private equity firms (Cumming et al., 2009). This result contradicts existing research that finds a positive effect of fund manager's experience (also measured by age) on stage drift activity (Cumming et al.,

[43] According to Wooldridge (2009) we can interpret the results as if the variable were just ln-transformed, as the *GP Drift Score* values contain relatively few zeros (98 out of 2,799 [~3.5%] resp. 97 out of 2784 [~3.5%]).

2009)[44]. Cumming et al. (2009) argue that young fund managers drift less because they want to signal their ability to find attractive investments within their pre-stated investment focus and, coincidentally, to avoid a loss of reputation due to bad investments outside that focus. Our result suggests other explanations. First, since older general partners are often also large in size[45], they are able to be invested in a variety of investments at the same time. This often means that their portfolios are already diversified concerning industries, regions and stages of their investments. To trigger a strong style drift, they either have to shift their proportions of invested capital from one style to another by a substantial degree or invest a significant amount in a completely new style. By implication, young and small general partners trigger style drifts more easily. Our results are supported by other research that also finds a negative effect of a general partner's age on style drift activity (Langer et al., 2007; Bubna et al., 2015). Langer et al. (2007) provide a further explanation for the negative effect. They argue that old, well-established general partners with more experience have a solid reputation and a developed network. These circumstances help them find promising investment opportunities within their ordinary investment foci, hence lowering the tendency to drift. Lastly, it is also possible that less experience leads to a lowered ability of fund managers to identify attractive targets within their home turfs, thus forcing them to drift.

[44] Similar to our results, Cumming et al. (2009) report a statistically significant but economically less important effect.

[45] Positive correlation at the 1% significance level between *GP Invested Capital to Inv.* and *GP Age.*

Table 2-3: Pooled OLS regression – style drift score

This table presents pooled OLS regressions of determinants of style drifts. The unit of analysis is a GP year (including all transactions conducted by a unique GP in a specific year). We use the *ln (1 + GP Drift Score)* as the dependent variable. The table lists seven different models. Model 1 analyzes the isolated effect of *GP Age (ln)* on drift activity. Model 2 does the same with *GP Invested Capital to Inv. (ln)*, measured in total invested capital in millions of USD from the GP's origin to the current year of investment. Models 3-7 include dummy variables for the type and region of private equity investors (*GP Type* [BO = 1; VC = 0]; *GP Not US-Based* [not US-based = 1; US-based = 0]). Next, we include a *Competition* variable that measures private equity type specific raised capital by a rolling calculation over four years and normalizes this amount with a regional GDP figure. Further, we control for public market conditions. Our *Recession Indicator* dummy equals one if the yearly MSCI world average in a specific year was more than 5% lower than the average value one year before. Our *Boom Indicator* equals one if the yearly change of the MSCI world average was greater than +20%. Models 1-5 estimate the standard errors using Huber-White sandwich estimators (Huber, 1967). Model 4 further includes time-fixed effects at a year level. Model 5 also incorporates firm-fixed effects at a general partner level in addition to time-fixed effects. Model 6 shows an OLS regression with clustered standard errors at the GP level and, further, to include year dummies. Model 7 is a regression with two-way clustering on firm and year effects (Petersen, 2009). We show coefficients with their corresponding significance levels. *, ** and *** denote statistical significance at the 10%, 5% and 1% level, respectively. In parentheses we see the corresponding t-statistics.

	Pooled OLS						
	GP Drift Score *(ln (1 + GP Drift Score))*						
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
GP Age (ln)	-0.024***		-0.013**	-0.014***	-0.028*	-0.014**	-0.013**
	(-5.802)		(-2.500)	(-2.669)	(-1.761)	(-2.250)	(-2.542)
GP Invested Capital to Inv. (ln)		-0.010***	-0.009***	-0.010***	-0.016**	-0.010***	-0.009***
		(-5.679)	(-3.923)	(-4.045)	(-2.077)	(-3.568)	(-2.913)
GP Type (Dummy)			0.019**	0.022***		0.022**	0.019*
			(2.507)	(2.614)		(2.076)	(1.901)
GP Not US-Based (Dummy)			0.014**	0.007		0.007	0.014
			(1.973)	(0.674)		(0.527)	(1.305)
Competition			1.017**	0.537	0.096	0.537	1.017*
			(2.321)	(0.790)	(0.127)	(0.663)	(1.745)
Public Market Control Dummies (Reference normal Year)							
Recession Indicator (Dummy)			-0.025***	0.082*	0.163**	0.082*	-0.025***
			(-3.355)	(1.744)	(2.147)	(1.679)	(-3.467)
Boom Indicator (Dummy)			0.018**	0.093**	0.176**	0.093**	0.018***
			(2.291)	(2.162)	(2.349)	(2.085)	(3.374)
Constant	0.169***	0.163***	0.159***	0.082**	0.071*	0.082**	0.159***
	(15.248)	(15.700)	(13.041)	(2.222)	(1.662)	(2.246)	(10.943)
GP years	2799	2799	2784	2784	2784	2784	2784
Year FE	NO	NO	NO	YES	YES	YES	NO
PE Firm FE	NO	NO	NO	NO	YES	NO	NO
Clustering year level	NO	NO	NO	NO	NO	NO	YES
Clustering PE firm level	NO	NO	NO	NO	NO	YES	YES
R-squared	0.013	0.016	0.032	0.043	0.266	0.043	0.032

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

Model 2 shows a negative effect of *GP Invested capital to Inv.*, our proxy for PE firm size, on the style drift score of general partners. The result is statistically significant to the 1% significance level and persists in all specifications at 1% (Models 3-4, 6-7) or 5% (Model 5) significance levels. We use the natural logarithm of the money amount invested. Model 2 estimates that the style drift score decreases by roughly -0.1% if a general partner increases her total invested capital by 10% until the specified date (Wooldridge, 2009). The coefficients in the other models estimate a similar effect. Given no theoretical limit of invested capital and a wide range in the variable (up to USD >30 billions), the economic significance is given. It follows that large general partners, in terms of capital invested, tend to drift less in their investment foci. This result is in line with our explanation of the effect of general partners' age on drifting activity. Concerning PE firm size, the same rationale is valid; it says that, given the wide spread of current investments of large general partners, they can invest in a variety of portfolio companies and not trigger a style drift (see explanation above). Other than us, Langer et al. (2007) find a positive effect on fund size on style drift activity. The difference in effect direction could stem from the usage of another data set as well as from the different measurement of style drifts (stage drifts in the case of Langer et al. (2007)). However, the positive correlation between *GP Invested Capital to Inv.* and *GP Age*[46] supports our estimates and effect explanation.

While Models 1 and 2 analyze the isolated effects of general partners' age/experience and size on their style drifting activities, Models 3 to 7 validate these findings including control variables. Here, we find further explanatory impacts as well. The *GP Type* dummy variable shows a positive effect on the style drift score, meaning that buyout stage oriented general partners seem to drift more. Models 3, 4 and 6 estimate this effect at significant levels (1% or 5%). Explanations can be found by looking at our style drift measure, which is calculated on industry, geographical and development stage information of portfolio companies. Since venture capital oriented general partners are very active in their portfolio companies, those

[46] Positive correlation at the 1% significance level between *GP Invested Capital to Inv.* and *GP Age.*

fund managers tend to be very specialized within their home turf (Manigart et al., 2006; Achleitner and Braun, 2010). This home turf is normally defined by exactly those three factors of industry, region, and development stage. It is conceivable that venture capitalists, due to their high degree of specialization, are more restricted within their investment foci and are less prone to style drift. Another explanation would be that a buyout fund manager is more willing to invest globally, which would again explain why this type of private equity investor tends to drift more.

We find some indication of a relation between the headquarters location of a general partner and her style drift activity. Model 3 shows a significant positive effect of our location variable (*GP Not US-Based*) on *GP Drift Score*. This suggests that general partners originally located outside the United States style drift more. Given the fact that the US is a favorable private equity market, including lower refusal rates from potential portfolio companies against this type of financing, US general partners could feel less pressured to drift. However, this argument just refers to regional style drifts. In addition to that, the significance of the effect disappears in Models 4, 6 and 7.

Concerning the effect of *Competition* on style drift activity, we find a weak significant positive effect (Model 3 at the 5% and Model 7 at the 10% significance level). This might suggest that fund managers tend to drift more if the whole private equity industry registers rising incoming capital. During those times, there is a significant amount of dry powder and therefore investment pressure in the market. So far, this does not indicate whether the drifts are successful or not (for performance implications, see Sections 1.4.2. and 1.4.3.). However, it does indicate that fund managers could have problems finding suitable investment opportunities within their ordinary investment foci during those times. This interpretation is in line with the findings of Gompers and Lerner (2000), Ljungqvist and Richardson (2003b) and Langer et al. (2007). Langer et al. (2007) adds an additional explanation for the competition effect. Since limited partnerships are temporary, fund managers could have an incentive to

invest the committed capital until the funds' lifetime ends, ignoring their ordinary investment strategies. The whole competition discussion has a contemporary relevance because increasing capital inflows in private equity funds lead to record levels of dry powder waiting to be invested. Referring to preqin data, Bain & Company's Global Private Equity Report 2016 reports USD 1,307 billion of available cash in 2015 – an amount that has more than doubled since 2005 (USD 558 billon) (Bain & Company, 2016).

Looking at our *Recession* and *Boom Indicators*, we can discuss the effects of public market conditions on style drift activity. Model 3, without any fixed effects, and Model 7, with two-way clustering and full specification, estimate a negative effect of recession years on style drift score at the 1% significance level. We see some problems with multicollinearity in Models 4-6. Because the recession dummy is year-invariant and collinear with the fixed effects, we do not interpret the switched signs in these specifications. On the other hand, we observe a significant positive effect of boom years on style drift activity (Models 3 to 7 at 1-5% significance levels). Both estimates fit together, meaning that private equity fund managers tend to stick to their investment foci in recession years and feel confident investing outside their home turfs in boom periods. This finding contradicts existing research. Cumming et al. (2009) argue that it is easier for general partners to find suitable investments within their investment foci in boom periods. Their analysis supports their argument with a significant negative impact of a dummy variable for the boom years 1998-2000 on stage drift activity. The difference from our results could stem from differences in variables. We identify more boom years in our observation period and define style drifts not only based on stage but also on industry and geographical drift activity weighted by capital invested. Our conclusion is that favorable public market conditions, such as increased investment opportunities, that come along with boom periods (Audretsch and Acs, 1994; Gompers and Lerner, 2004; Langer et al., 2007) tempt fund managers to invest in new areas.

So far, our analysis identifies some key determinates of private equity style drifts. The main takeaways are that general partners' experience and a buyout stage orientation have a positive impact on style drift activity. Furthermore, we find that general partners drift more in boom and less in recession periods. Having gained a better understanding of the determinants of style drift activity, we now look at their implications for private equity performance.

1.4.2. How do style drifts affect investment performance?

In this section, we analyze and discuss the performance implications of style drifts in private equity. Table 2-4 provides pooled OLS regressions with the dependent variable *GP PME*. Again, we present different models to ensure the robustness of our results. The statistical specifications of Models 2 to 6 are equal to the ones in Models 3 to 7 in Table 2-3 (described in detail in Section 1.4.1.). The regressions are conducted with the natural logarithm of *GP PME*.

Our regressions show a significant positive effect of a general partner's style drift activity on her performance (variable of interest is ln (1 + *GP Drift Score*)). The effect in our full specification (Model 6) is significant at the 1% significance level. It estimates that a 10% increase in the style drift score leads to a 2.7% increase in performance (*GP PME*) (Wooldridge, 2009). The specification includes control variables for certain general partner characteristics, private equity competition and public market conditions[47]. The impact of drift activity on performance is also confirmed by regressions on investment multiples reported in Table 2-7 in Section 1.6.3. (appendix).

[47] Descriptions and transformations of the control variables are described in Sections 3.2 and 4.1.

Table 2-4: Pooled OLS regression – performance measure GP PME

Table 2-4 presents the results from pooled OLS regressions of GP level PMEs with style drift activity and other explanatory variables. The unit of analysis is a GP year (including all transactions conducted by a unique GP in a specific year). We use the natural logarithm of *GP PME* as the dependent variable. The table lists six different specifications. Model 1 analyzes the isolated effect of *ln (1 + GP Drift Score)* on *GP PME (ln).* Models 2-6 further include the following variables: *GP Age (ln)* as a proxy for experience and measured in years, *GP Invested Capital to Inv. (ln)* as a proxy for firm size and measured in total invested capital in millions of USD from the GP's origin to the current year of investment and dummy variables for the type and region of private equity investors (*GP Type* [BO = 1; VC = 0]; *GP Not US-Based* [not US-based = 1; US-based = 0]). Further, we include a *Competition* variable that measures private equity type specific raised capital by a rolling calculation over four years and normalizes this amount with a regional GDP figure. Last, we control for public market conditions. Our *Recession Indicator* dummy equals one if the yearly MSCI world average in a specific year was more than 5% lower than the average value one year before. Our *Boom Indicator* equals one if the yearly change of the MSCI world average was greater than +20%. Models 1-4 estimate the standard errors using Huber-White sandwich estimators (Huber, 1967). Model 3 further includes time-fixed effects at a year level. Model 4 also incorporates firm-fixed effects at a general partner level in addition to time-fixed effects. Model 5 shows an OLS regression with clustered standard errors at the GP level and further to include year dummies. Model 6 is a regression with two-way clustering on firm and year effects (Petersen, 2009). We show coefficients with their corresponding significance levels. *, ** and *** denote statistical significance at the 10%, 5% and 1% level, respectively. In parentheses we see the corresponding t-statistics.

	Pooled OLS					
	***GP PME* (ln)**					
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
GP Drift Score (ln (1 + GP Drift Score))	0.348*** (2.661)	0.270** (2.124)	0.232* (1.821)	0.269* (1.690)	0.232* (1.737)	0.270*** (2.900)
GP Age (ln)		0.028 (0.742)	0.020 (0.515)	0.160* (1.682)	0.020 (0.440)	0.028 (0.613)
GP Invested Capital to Inv. (ln)		-0.015 (-1.236)	-0.023* (-1.900)	-0.129*** (-3.731)	-0.023 (-1.588)	-0.015 (-1.291)
GP Type (Dummy)		0.460*** (6.377)	0.482*** (6.533)		0.482*** (5.477)	0.460*** (3.977)
GP Not US-Based (Dummy)		-0.087* (-1.754)	-0.152** (-2.205)		-0.152* (-1.940)	-0.087 (-1.484)
Competition		-4.127 (-1.388)	-7.795* (-1.714)	0.634 (0.112)	-7.795 (-1.565)	-4.127 (-1.054)
Public Market Control Dummies (Reference normal Year)						
Recession Indicator (Dummy)		0.012 (0.164)	-0.921 (-1.384)	-0.966 (-1.626)	-0.921 (-1.379)	0.012 (0.228)
Boom Indicator (Dummy)		0.011 (0.211)	-1.075* (-1.658)	-0.991* (-1.754)	-1.075 (-1.649)	0.011 (0.162)
Constant	0.340*** (11.885)	0.084 (0.813)	1.213* (1.908)	1.590*** (3.374)	1.213* (1.910)	0.084 (0.562)
GP years	2799	2784	2784	2784	2784	2784
Year FE	NO	NO	YES	YES	YES	NO
PE firm FE	NO	NO	NO	YES	NO	NO
Clustering year level	NO	NO	NO	NO	NO	YES
Clustering PE firm level	NO	NO	NO	NO	YES	YES
R-squared	0.002	0.025	0.037	0.201	0.037	0.025

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

As mentioned in the introduction section, substantial style drifts are not appreciated by limited partners (Cumming et al., 2009; Buzzacchi et al., 2015), because they change the planned risk and return profiles of limited partners' portfolios. Our results show that the drifts generally lead to improved performance. Although this does not change the fact that they alter the risk and return profile of their investors, it shows that there are return benefits for them after all. Our investigation further suggests that fund managers know what they do when they decide to turn away from their ordinary investment foci. Langer et al. (2007), who also find a positive impact of stage drift on performance, put our argument in the context of portfolio management theory. Active portfolio management is necessary to ensure adequate returns within the relatively long private equity investment horizons when market conditions and opportunities are changing. Since we analyze style drift and performance at a general partner level, our findings suggest that there is a positive diversification effect of this investment practice. It seems that fund managers use style drifts to enhance the overall return of their portfolios. However, depending on risk and return considerations, this is not strictly a benefit for limited partners.

Our results are consistent with the findings of Cumming et al. (2009), who find a positive impact of fund-stage drifts on the likelihood of an IPO (their proxy variable for good performance). Contrary to this, Bubna et al. (2015) report a negative effect of drift on the performance of venture capitalists. This result is not directly comparable to ours because Bubna et al. (2015) focus on venture capitalists, while our investigation and those of Langer et al. (2007) and Cumming et al. (2009) analyze both types of private equity: buyouts and venture capital. We discuss a differentiation of performance implications between both types of private equity managers later in this section.

Besides the performance implication of style drift activity, we gain interesting insights from the control variables. Starting with the characteristics of general partners, we find significant evidence that the private equity type of a general partner impacts her performance. Buyout

fund managers perform better than venture capitalists. Our full specification (Model 6) shows a positive coefficient with a significance of 1%. Models 2, 3 and 5 confirm this result to the same significance level. Being a buyout stage oriented general partner increases the PME by 58.4%[48] (Model 6).

Further, we find some evidence that US-based general partners perform better than fund managers located outside the US[49] (Model 3 at the 5% significance level) and that bigger general partners (measured by invested capital up to the current observation year) perform worse than smaller private equity firms (Model 4 at the 1% significance level). Finally, we find a very weak indication for a positive impact of experience/age on the PME of a general partner (Model 4 at the 10% significance level).

Turning to our private equity *Competition* variable, we see weak evidence for a negative impact on performance (Model 3 at the 10% significance level). However, we find statistically stronger results in our analysis on investment multiple performance (see Table 2-7 in Section 1.6.3. [appendix]). The rationale of this effect is that increasing competition leads to higher prices for portfolio companies and, finally, to lower returns. Kaplan and Strömberg (2009) and Harris et al. (2014) also find a negative impact of capital committed to private equity on fund performance.

In the next paragraph of this section, we come back to the initial discussion about the performance implication of style drifts. While we find evidence for a positive impact of drift activity on general partner performance (Table 2-4), there is still the investigation of Bubna et al. (2015) that reports a negative effect. Since they only analyze venture capitalists and this could lead to the deviating result, we want to split our analysis as well. Table 2-5 presents this differentiation between subsamples of buyout and venture capital oriented general partners. There are three Models with the *GP PME* (ln) as dependent variable. For comparison reasons, Model 1 is equal to Model 6 in Table 2-4. All models in Table 2-5 provide regressions with

[48] 58.4% = 100 * (EXP(0.460)-1) (Wooldridge, 2009).

[49] The impact of the US/Not US Dummy is statistically stronger in the analysis of general partners' investment multiples (see Table 2-7 in Section 1.6.3.[appendix]).

two-way clustering on firm and year effects (Petersen, 2009)[50]. Model 2 shows results only for buyout-oriented general partners and Model 3 only for venture capitalists.

As we can see, Model 2 confirms a positive performance implication of style drift activity for buyout stage oriented general partners. The effect is significant at the 1% significance level (variable of interest is ln (1 + *GP Drift Score*)). Concerning the *GP PME*, Model 2 estimates that a 10% increase in the style drift activity leads to a ~3.1% increase in performance for buyout fund managers (Wooldridge, 2009). On the contrary, Model 3 shows no significant relation between style drifts and performance. This means that we have to adjust our earlier statement: There is only a positive impact of style drifts on general partner performance for buyout stage oriented fund managers[51]. This is consistent with our finding that buyout fund managers tend to drift more than venture capitalists (see Table 2-4). The fact that venture capital partners drift less could explain why there is no significant relation between drift and performance for them. We ascribe this finding to the differences in support and resources that general partners have to provide to their portfolio companies. Young ventures need more managerial experience and support (Gupta and Sapienza, 1992; De Clercq et al., 2001; Martin et al., 2002; Achleitner and Braun, 2010). Thus, venture capitalists normally practice a very active management of their portfolio companies and are highly specialized in certain areas (Manigart et al., 2006; Achleitner and Braun, 2010). This may restrict them within their investment foci. These differences can explain why we see less drift of venture capitalists and consequently a significant effect of drift activity only on performance of buyout oriented general partners. For buyout firms, in contrast, it seems that style drifts are normal business practice to generate returns. To investigate if this is an agency issue between general and limited partners, we have to consider whether these drifts are opportunistic or by necessity. We will discuss this question in section 1.4.3..

[50] The same analyses with other model specifications (namely the estimation of standard errors with Huber-White sandwich estimators (Huber (1967) in combination with PE firm- and year fixed-effects as well as the OLS regression with clustered standard errors at the GP level in combination with year dummies) show slightly less significant but similar effects of the drift activity on GP performance.

[51] See also Table 2-8 in Section 1.6.3. (appendix) for the same analysis with general partners' investment multiple as dependent variable.

Table 2-5: Pooled OLS regression – performance measures GP PME

Sorted by GP's private equity type

This table reports the results from pooled OLS regressions of GP level PMEs with style drift activity and other explanatory variables, split by fund managers' private equity type orientation (buyout- and venture capital-oriented). The unit of analysis is a GP year (including all transactions conducted by a unique GP in a specific year). We use the natural logarithm of *GP PME* as dependent variable. All of the regressions apply a two-way clustering on firm and year effects (Petersen, 2009). The explanatory variables included are: *ln (1 + GP Drift Score); GP Age (ln)* as a proxy for experience and measured in years; *GP Invested Capital to Inv. (ln)* as a proxy for firm size and measured in total invested capital in millions of USD from the GP's origin to the current year of investment; a dummy variable for the region of private equity investors (*GP Not US-Based* [not US-based = 1; US-based = 0]); a *Competition* variable that measures private equity type specific raised capital by a rolling calculation over four years and normalizes this amount with a regional GDP figure; a *Recession Indicator* dummy that equals one if the yearly MSCI world average in a specific year was more than 5% lower than the average value one year before; and a *Boom Indicator* that equals one if the yearly change of the MSCI world average was greater than +20%. Model 1 is equal to Model 6 in Table 2-4. Models 2 and 3 have the same specification (two-way clustering) and split our data sample into buyout- and venture capital oriented general partners. We show coefficients with their corresponding significance levels. *, ** and *** denote statistical significance at the 10%, 5% and 1% level, respectively. In parentheses we see the corresponding t-statistics.

	Pooled OLS		
	***GP PME* (ln)**		
Variables	**Model 1 (all GPs)**	**Model 2 (Subsample BO)**	**Model 3 (Subsample VC)**
GP Drift Score (ln (1 + GP Drift Score))	0.270*** (2.900)	0.308*** (3.423)	-0.012 (-0.029)
GP Age (ln)	0.028 (0.613)	0.023 (0.626)	0.012 (0.092)
GP Invested Capital to Inv. (ln)	-0.015 (-1.291)	-0.017 (-1.468)	-0.001 (-0.035)
GP Type (Dummy)	0.460*** (3.977)		
GP Not US-Based (Dummy)	-0.087 (-1.484)	-0.080 (-1.360)	-0.141 (-0.771)
Competition	-4.127 (-1.054)	-1.320 (-0.495)	-32.716*** (-3.481)
Public Market Control Dummies (Reference normal Year)			
Recession Indicator (Dummy)	0.012 (0.228)	0.121*** (2.602)	-0.297*** (-2.787)
Boom Indicator (Dummy)	0.011 (0.162)	-0.031 (-0.496)	0.178 (1.518)
Constant	0.084 (0.562)	0.518*** (5.344)	0.348 (0.994)
GP years	2784	2184	600
Clustering year level	YES	YES	YES
Clustering PE firm level	YES	YES	YES
R-squared	0.025	0.006	0.029

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

Concerning the other explanatory variables we can gain more insights from Table 2-5[52]. First, during recession periods, buyout fund managers seem to gain and venture capitalists seem to suffer. More precisely, our regressions show that recession periods have a positive impact on the PME of buyout stage oriented general partners (Model 2: *Recession Indicator* is significantly positive at the 1% significance level) and a negative one on the PME of venture capitalists (Model 3: *Recession Indicator* is significantly negative at the 1% significance level). We can conclude that buyout fund managers perform relatively better against public markets during recession periods. An explanation for the negative impact for venture capitalists could be that their portfolio companies are immature and relatively small and therefore liable to recession shocks. Second, and more interesting in our discussion of style drift activity, high private equity competition seems to put pressure on venture capitalists only (*Competition* variable significantly negative in Model 3, not in Model 2)[53]. We can conclude that venture capitalists may have certain performance issues in comparison to public markets in times when venture capital funds register increasing capital inflows. Does that mean, then, that buyout competition has no influence on the performance (PME) of buyout firms? Since we want to find out if the positive impact of drift activity on buyout firm performance is based on opportunistic or necessity drifts, the competition variable can help us find out more about the intentions of drift activity. Perhaps competition has a moderating effect on the relation between general partners' drift scores and performances.

1.4.3. Do style drifts represent an agency problem between general and limited partners?

So far, we find a significant positive effect of style drift activity on the performance of buyout oriented general partners. In this section, we link this relationship to our initial discussion of potential agency issues between general and limited partners. Since we find a significant

[52] Descriptions and transformations of the explanatory variables are in Sections 3.2 and 4.1.
[53] The significant negative impact of *Competition* on *GP IM* performance of both types of general partners does not contradict this, as the PME is a relative measure in comparison to public markets and the investment multiple is an absolute performance measure (see Table 2-8 in Section 1.6.3. [appendix]).

relationship only for buyout firms, we concentrate our discussion on them. We argue that style drifts as such do not have to be unfavorable for limited partners. The positive performance effect documented in Table 2-5 is a first indication that this might be true. However, the real question in the context of the principal-agent relation of general and limited partners is: Why do buyout fund managers decide to drift? It makes a huge difference whether a general partner deliberately decides to invest outside her normal style or whether she is pressurized to deploy capital and therefore moves outside the home turf. The first drift intention should not represent an agency problem. Over the long time of a closed-end limited partnership, a general partner can have good reasons to invest in new areas. She can get insider information about attractive targets, or the market conditions in the ordinary styles have changed disadvantageously. However, the drift by necessity could illustrate an agency conflict for limited partners. If the general partner decides to drift, because she feels pressured by rising competition in their ordinary investment areas, this can lead to an uncalculated increase in risk or lower returns of the new investments. Therefore, we use our *Competition* variable as a proxy for investment pressure, to test for a potential interaction effect of competition in the private equity market and style drift activity on general partner performance.

Table 2-6 shows pooled OLS regressions with the natural logarithm of GP PME as dependent variable. We differentiate between our buyout and venture capital subsamples (as in Table 2-5) and further between high and low private equity competition (Models 1, 2, 4, 5). Additionally, we analyze potential interaction effects of competition and drift score on the general partner performance in Models 3 and 6. The statistical specifications of all six models equal the ones of Model 5 in Table 2-3 (described in detail in Section 1.4.1.).

Table 2-6: Pooled OLS regression – performance measures GP PME

Sorted by GP's private equity type & competition

Table 2-6 incorporates six pooled OLS regressions (Models 1-6) with the natural logarithm of *GP PME* as dependent variable. Models 1-3 represent our subsample of investments conducted by buyout firms, and Models 4-6 our subsample of transactions by venture capitalists. We further split the respective subsamples by low and high private equity market competition (low <= median; high > median). The remaining Models 3 and 6 include an interaction term of competition and style drift score binary dummies. For all regressions the unit of analysis is a GP year (including all transactions conducted by a unique GP in a specific year); they estimate the standard errors using Huber-White sandwich estimators (Huber, 1967) and include year fixed- and PE firm fixed-effects. The explanatory variables included are: *ln (1 + GP Drift Score)*, *GP Drift Score* low/high Dummy (low <= median; high > median), *Competition* low/high Dummy (low <= median; high > median), the interaction term *Competition* (grouped) X *GP Drift Score* (grouped), *GP Age (ln)* as a proxy for experience and measured in years, *GP Invested Capital to Inv. (ln)* as a proxy for firm size and measured in total invested capital in millions of USD from the GP's origin to the current year of investment, a *Recession Indicator* dummy equals one if the yearly MSCI world average in a specific year was more than 5% lower than the average value one year before and a *Boom Indicator* equals one if the yearly change of the MSCI world average was greater than +20%. We show coefficients with their corresponding significance levels. *, ** and *** denote statistical significance at the 10%, 5% and 1% level, respectively. In parentheses we see the corresponding t-statistics.

	Pooled OLS					
	***GP PME* (ln)**					
	Subsample BO			**Subsample VC**		
Variables	Model 1 (low competition)	Model 2 (high competition)	Model 3 (interaction comp. X drift)	Model 4 (low competition)	Model 5 (high competition)	Model 6 (interaction comp. X drift)
GP Drift Score (ln (1 + GP Drift Score))	0.048 (0.240)	0.481** (2.139)		-0.514 (-0.794)	0.955 (0.642)	
GP Drift Score (low/high Dummy)			-0.084 (-1.314)			0.013 (0.076)
Competition (low/high Dummy)			-0.115 (-1.199)			0.047 (0.151)
Competition (grouped) X *GP Drift Score* (grouped)			0.150* (1.712)			-0.018 (-0.058)
GP Age (ln)	0.298* (1.924)	0.292 (1.382)	0.137 (1.507)	-0.266 (-0.767)	0.131 (0.095)	0.154 (0.452)
GP Invested Capital to Inv. (ln)	-0.076* (-1.837)	-0.348*** (-4.273)	-0.161*** (-5.023)	0.354* (1.660)	0.002 (0.003)	0.060 (0.386)
Public Market Control Dummies (Reference normal Year)						
Recession Indicator (Dummy)	-1.155 (-1.482)	0.550* (1.934)	0.136 (0.356)	-4.726** (-2.397)	-0.819 (-0.805)	-3.732*** (-2.659)
Boom Indicator (Dummy)	-3.008*** (-3.444)	0.408 (1.442)	-0.007 (-0.017)	-3.878** (-2.059)	-0.181 (-0.416)	-2.930** (-2.315)
Constant	1.425*** (3.857)	0.669 (1.483)	0.926*** (3.793)	3.282*** (2.895)	0.881 (0.425)	2.316*** (3.068)
GP years	1028	1156	2184	407	193	600
Year FE	YES	YES	YES	YES	YES	YES
PE firm FE	YES	YES	YES	YES	YES	YES
R-squared	0.273	0.251	0.169	0.320	0.323	0.242

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

We find that the positive performance effect of style drift activity for buyout firms holds true when competition is high. The effect in Model 2 is significant at the 5% significance level (variable of interest is ln (1 + *GP Drift Score*)). It implies that a 10% increase in style drift activity leads to a ~4.8% increase in the PME (Wooldridge, 2009). Further, in Model 3 we find weak evidence that there is a positive interaction effect of private equity competition and style drift activity on the performance of buyout stage oriented general partners (significant at the 10% significance level). We interpret this as support for opportunistic drifts. Our results suggest that buyout fund managers drift to increase returns when competition in the private equity markets is high. As already mentioned, these drifts with positive return implications can be based on insider information about attractive targets or on a professional and superior market/business judgment of general partners. Consequently, it seems that the incentives for buyout fund managers work in such a way that general partners do not take investment opportunities outside their ordinary styles which generate inferior returns to limited partners. This does not change the fact that style drifts can alter the risk of limited partners' entire portfolios. But overall, the evidence we present suggests that there is no agency conflict between buyout stage oriented firms and limited partners related to style drifts.

Due to the lack of significance in Models 4 to 6 we cannot prove or disprove this statement for the business relations between venture capitalists and limited partners.

1.5. Conclusion

Our paper builds on existing literature about the determinants and performance implications of style drifts in private equity. We connect this investment practice with a potential agency conflict between general and limited partners. To our knowledge, there are currently just three papers about private equity style drifts (Langer et al., 2007; Cumming et al., 2009; Bubna et al., 2015). We extend the existing findings threefold: First, we use a superior data sample of 12,426 unique private equity transactions executed by 340 general partners. The sample includes information about investment style defining characteristics of portfolio companies

such as industry, geographical region and development stage. It further includes detailed cash flow information, which is essential for a precise performance measurement. In addition, we use data about buyout and venture capital managers, which provides us with a differentiation not analyzed sufficiently in existing research. Second, based on our detailed data set, we use precise performance measures for the analysis of performance implications of style drifts for general partners. Specifically, our paper is the first to employ the PME in the context of private equity style drifts. This measure allows for a direct comparison of private equity investments to public markets performance and has been increasingly applied in recent research (e.g., Kaplan and Schoar, 2005; Harris et al., 2014; Sorensen and Jagannathan, 2015; Braun et al., 2017). To ensure robust results we further investigate implications for investment multiples (see Section 1.6.3. [appendix]). Third, we measure style drift on the basis of a sophisticated formula by Bubna et al. (2015). This style drift measure is superior to existing binary measurements, as it involves the key style defining portfolio company characteristics (industry, region, development stage), it is weighted by invested capital, it is calculated over time and its intensity is dependent on the ordinary investment focus of a general partner. The last point means that the measure is based on real drifting activities of fund managers and is not calculated in comparison to an often broad pre-stated investment strategy reported by general partners during their fund raising. Not least, the incorporation of different portfolio company characteristics in the definition of style overcomes the limitations of existing research, which concentrates on development stage drifts (Langer et al., 2007; Cumming et al., 2009).

Our multivariate empirical analyses provide new insights about the determinants and performance implications of style drifts in private equity. Our work further contributes to the principal-agent discussion between fund managers and investors (Axelson et al., 2009). Our unit of analysis is a general partner year including all investments of every active fund manager per year. To reach robust results, we conduct different statistical specifications.

In the first part of our analysis we elaborate the question of when drifts are implemented. We find that age has a negative impact on general partners' style drift activities. Furthermore, our regressions estimate that a 10% increase of invested capital by a fund manager leads to a decrease of roughly -0.1% of her drift activity. Additionally, we show that buyout fund managers tend to drift more than venture capitalists. Concerning competition in private equity markets we find some evidence for more drift activity when levels of committed capital by limited partners are high. The effects of public market developments indicate that general partners drift less during recession and more during boom periods.

In the second part of our empirical analysis, we investigate the performance implications of style drifts. Controlling for other influence factors, we find a significant positive impact of style drifts on the performance of buyout fund managers. We show that a 10% increase in style drift activity leads to a ~3.1% increase in the PME of buyout stage oriented general partners. This finding suggests a certain diversification effect of style drifts. Our analysis confirms the research of Langer et al. (2007) and Cumming et al. (2009). We do not observe a significant impact of style drifts on the performance of venture capitalists. Therefore, we cannot confirm the findings of Bubna et al. (2015). In addition, we show that buyout fund managers perform relatively better against public markets during recession periods, and venture capitalists worse.

Concerning a potential agency conflict between general and limited partners, we find no evidence for such an issue. Using private equity competition as a proxy for intensified investment pressure on general partners, our results suggest that buyout fund managers drift to increase returns when competition is high. This implies that they opportunistically drift, based on superior information or market/business judgment. Based on our analysis, there is no agency conflict in relation to style drifts[54]. This finding is limited to the relation between buyout firms and their investors. Due to the lack of significance we cannot assess a potential agency issue between venture capitalists and limited partners.

[54] Our argument does not imply that style drifts cannot alter the risk of limited partners' entire portfolios in an unintended way for them.

In summary, this paper delivers new insights about the determinants of style drifts and shows robust performance implications of this investment practice. The latter is especially relevant for limited partners. We contribute to the existing literature about style drifting in private equity and link our analysis to the discussion of potential principal-agent issues between private equity fund managers and their investors.

This investigation has some limitations and provides suggestions for future research. First, our predictions on determinants and influences of drift activities could be influenced by high average drift scores recognized in early years of general partners. However, there were similar drift levels reached in later investment years. Since our drift measure is based on the change of proportions of invested capital, it is possible that these proportions could change more ordinarily than actively in early years. Our measurement does not differentiate between real and technical drift. Therefore, one limitation of our analysis is that we assume all drifts to be active drifts. It would be interesting to consider this issue in future research. Second, our statements about private equity performance implications are limited because we stop our analysis with performance measures at a general partner level and do not involve any risk and return assessments for limited partners. We further use private equity competition as a proxy for investment pressure. Therefore, our implication for the potential agency conflict between general partners and investors is limited to the accuracy of these approximations. Further, and related, we use the PME as performance measure. Although we enhance the validity of performance implications doing so, the incorporated opportunity cost benchmark is limited to the comparison to regional public market returns. Future research could analyze performance measures that adjust risk on a more individual level. Such a detailed measurement would also generate more insights for the principal-agent discussion. Third, due to data limitations we do not involve soft factors of general partners in our analyses. It is likely that general partners' organizational structures and team-specific skills influence the drift decisions and the performance of private equity management firms. The incorporation of this kind of information would further enhance the validity of style drift analyses. Fourth, our style drift

measurement is the same for investments of buyout firms and venture capitalists (see Section 1.6.1. [appendix]). It is conceivable that we need a more detailed industry differentiation for venture capital investments, because venture capitalists are highly specialized in very specific areas (Manigart et al., 2006; Achleitner and Braun, 2010). Therefore, it is possible that our style measurement does not capture venture capital drift sufficiently. Last, there is potential to further increase the general quality of data. Our sample only considers 932 transactions conducted outside the United States or Europe. This number represents 8% of our sample. An analysis of a more international data set could deliver new insights on style drifts. Further, our sample of transactions covers only up to 2012. Since then, the private equity industry has registered increasing capital inflows and record levels of dry powder (intensified competition). Therefore, an incorporation of current years into the investigation of style drifts would be interesting as well.

1.6. Appendix

1.6.1. 60 Styles

Style	Portfolio company's industry*	Portfolio company's region	Porfolio company's development stage
1.	Oil & Gas (0001)	North America	Buyout Stage
2.	Basic Materials (1000)		
3.	Industrials (2000)		
4.	Consumer Goods (3000)		
5.	Health Care (4000)		
6.	Consumer Services (5000)		
7.	Telecommunications (6000)		
8.	Utilities (7000)		
9.	Financials (8000)		
10.	Technology (9000)		
11.	Oil & Gas (0001)	Europe	
12.	Basic Materials (1000)		
13.	Industrials (2000)		
14.	Consumer Goods (3000)		
15.	Health Care (4000)		
16.	Consumer Services (5000)		
17.	Telecommunications (6000)		
18.	Utilities (7000)		
19.	Financials (8000)		
20.	Technology (9000)		
21.	Oil & Gas (0001)	RoW**	
22.	Basic Materials (1000)		
23.	Industrials (2000)		
24.	Consumer Goods (3000)		
25.	Health Care (4000)		
26.	Consumer Services (5000)		
27.	Telecommunications (6000)		
28.	Utilities (7000)		
29.	Financials (8000)		
30.	Technology (9000)		

Style	Portfolio company's industry*	Portfolio company's region	Porfolio company's development stage
31.	Oil & Gas (0001)	North America	Venture Capital Stage
32.	Basic Materials (1000)		
33.	Industrials (2000)		
34.	Consumer Goods (3000)		
35.	Health Care (4000)		
36.	Consumer Services (5000)		
37.	Telecommunications (6000)		
38.	Utilities (7000)		
39.	Financials (8000)		
40.	Technology (9000)		
41.	Oil & Gas (0001)	Europe	
42.	Basic Materials (1000)		
43.	Industrials (2000)		
44.	Consumer Goods (3000)		
45.	Health Care (4000)		
46.	Consumer Services (5000)		
47.	Telecommunications (6000)		
48.	Utilities (7000)		
49.	Financials (8000)		
50.	Technology (9000)		
51.	Oil & Gas (0001)	RoW**	
52.	Basic Materials (1000)		
53.	Industrials (2000)		
54.	Consumer Goods (3000)		
55.	Health Care (4000)		
56.	Consumer Services (5000)		
57.	Telecommunications (6000)		
58.	Utilities (7000)		
59.	Financials (8000)		
60.	Technology (9000)		

* According to Industry Classification Benchmark (ICB) from FTSE ** RoW = Rest of World

1.6.2. Application example style drift score

This application example makes more understandable the style drift score measure used in this paper. Before we calculate an application example, we start with some definitions and the theoretical explanation of the style drift score formula.

Style drift score = [55]

$$d_{jt} = 1 - \frac{P_{jt} \cdot P_{j,t-1}}{\|P_{jt}\| \times \|P_{j,t-1}\|}$$

P_{jt}: Style proportion vector

This formula represents the cosine similarity, which measures the similarity of vectors. The application of this measure in the context of private equity style investing was developed by Bubna et al. (2015). The formula contains a dot product in the numerator and a product of two vector norms in the denominator. For a given general partner *j*, a given year *t* and *n* styles we can write:

$$d_{jt} = 1 - \frac{\sum_{i=1}^{n} P_{jti} \cdot P_{j,t-1,i}}{\sqrt[2]{\sum_{i=1}^{n}(P_{jti})^2} \cdot \sqrt[2]{\sum_{i=1}^{n}(P_{j,t-1,i})^2}}$$

$$1 - \frac{P_{jt1}\,P_{j,t-1,1} + P_{jt2}P_{j,t-1,2} + \cdots + P_{jtn}P_{j,t-1,n}}{\sqrt[2]{(P_{jt1})^2 + (P_{jt2})^2 + \cdots + (P_{jtn})^2} \cdot \sqrt[2]{(P_{j,t-1,1})^2 + (P_{j,t-1,2})^2 + \cdots + (P_{j,t-1,n})^2}}$$

After this theoretical introduction, let us consider an example. The table below shows the investment activity of a general partner over eight years in three different styles (n=3). In a first step, let us assume the general partner conducts just three investments, one in the first year in a portfolio company with style 1, one in the fifth year in a company with style 2 and one last investment in the seventh year in a portfolio company with style 3. As one can see, the style drift scores change in the fifth and seventh year. There is no style drift score value

[55] Formula is based on Bubna et al. (2015).

for the first year because the score measures a yearly change in investment style and is therefore not calculable for the first investment year of a general partner.

	Style 1			**Style 2**			**Style 3**			**Total invested capital per Year**	**Cumulated invested capital (4 years)**	**Style drift score**
	Abs.	Abs. cum.	P_{jt1}	Abs.	Abs. cum.	Pjt2	Abs.	Abs. cum.	Pjt3			
Year 1	10	10	100%		0	0%		0	0%	10	10	
Year 2		10	100%		0	0%		0	0%	0	10	0.00
Year 3		10	100%		0	0%		0	0%	0	10	0.00
Year 4		10	100%		0	0%		0	0%	0	10	0.00
Year 5		0	0%	10	10	100%		0	0%	10	10	1.00
Year 6		0	0%		10	100%		0	0%	0	10	0.00
Year 7		0	0%		10	20%	40	40	80%	40	50	0.76
Year 8		0	0%		10	20%		40	80%	0	50	0.00

In the first four years, all the invested capital is invested in Style 1. Consequently, the style drift score is zero. In the fifth year, it reaches the maximum amount of one. The investment of 10 in the first year is not considered for the calculation of the style drift score in year five, because we use a style observation period of four years[56]. Nevertheless, the score of one is correct, as the total cumulated invested capital over the last four years (including the current year) is still 10 in year five and, therefore, the style proportion changes from 100% in Style 1 to 100% in Style 2. In year seven, in contrast, the measure considers the investment in year five, as it was conducted just two years before. The style proportions show that the general partner is invested 20% in Style 2 and 80% in Style 3. In the next table, we show the same example with the difference that the general partner invests just 10 monetary units in Style 3 instead of 40. As desired the drift score decreases from 0.76 to 0.29, as the general partner changes the investment focus less strongly.

[56] An observation period of four years reflects the median holding period of portfolio companies in our sample.

	Style 1			Style 2			Style 3			Total invested capital per Year	Cumulated invested capital (4 years)	Style drift score
	Abs.	Abs. cum.	P_{jt1}	Abs.	Abs. cum.	Pjt2	Abs.	Abs. cum.	Pjt3			
Year 1	10	10	100%		0	0%		0	0%	10	10	
Year 2		10	100%		0	0%		0	0%	0	10	0.00
Year 3		10	100%		0	0%		0	0%	0	10	0.00
Year 4		10	100%		0	0%		0	0%	0	10	0.00
Year 5		0	0%	10	10	100%		0	0%	10	10	1.00
Year 6		0	0%		10	100%		0	0%	0	10	0.00
Year 7		0	0%		10	50%	10	10	50%	10	20	0.29
Year 8		0	0%		10	50%		10	50%	0	20	0.00

In the last step, let us assume that the general partner invests more frequently. Overall, she invests 60 monetary units as in the first table, but smaller amounts. This investment activity is closer to real investment activities. Interestingly, the style drift scores are smaller. Given that the general partner invests similar amounts and the style proportions do not change heavily, this result is as expected.

	Style 1			Style 2			Style 3			Total invested capital per Year	Cumulated invested capital (4 years)	Style drift score
	Abs.	Abs. cum.	P_{jt1}	Abs.	Abs. cum.	Pjt2	Abs.	Abs. cum.	Pjt3			
Year 1	4	4	80%	1	1	20%		0	0%	5	5	
Year 2	4	8	57%	2	3	21%	3	3	21%	9	14	0.06
Year 3	2	10	33%	9	12	40%	5	8	27%	16	30	0.12
Year 4		10	29%		12	34%	5	13	37%	5	35	0.02
Year 5		6	17%	5	16	46%		13	37%	5	35	0.04
Year 6		2	8%		14	54%		10	38%	0	26	0.02
Year 7	6	6	21%	5	10	36%	7	12	43%	18	28	0.06
Year 8		6	26%		10	43%		7	30%	0	23	0.03

1.6.3. Empirical results for GP IM as performance measure

This section shows the empirical results of style drift implications on general partner performance with the investment multiple as performance measure. The results serve as robustness check for our analyses on PMEs. The following pages show three Tables (2-7, 2-8, 2-9).

Table 2-7 is the complement of Table 2-4, Table 2-8 that of Table 2-5 and Table 2-9 that of Table 2-6 in the main part of this paper.

The gross investment multiple (IM) is defined as total proceeds received by the general partner[57] divided by total capital invested. This calculation is based on cash flows before any deductions for carried interest and management fees.

We winsorize gross IMs at the investment level at the 97th percentile. To get multiples at general partner year level, we weight the measure by total invested capital per investment in a certain year. The resulting variable is called *GP IM*. For our pooled OLS regressions we use the natural logarithm of *GP IM*.

We show that our findings in the main part are robust. The results of the regressions with the *GP IM* as dependent variable are similar to the ones with the *GP PME* presented in the paper.

[57] Total proceeds = dividends and proceeds from sale.

Table 2-7: Pooled OLS regression – performance measure GP IM

Table 2-7 shows the results from pooled OLS regressions of GP level investment multiples (IM) with *GP Drift Score* and other explanatory variables. It represents the same analyses as in Table 2-4 with *GP IM* as dependent variable instead of *GP PME*. The unit of analysis is a GP year (including all transactions conducted by a unique GP in a specific year). We use the natural logarithm of *GP IM* as the dependent variable. The table presents six different specifications. Model 1 analyzes the isolated effect of *ln (1 + GP Drift Score)* on *GP IM (ln).* Models 2-6 include the following variables: *GP Age (ln), GP Invested Capital to Inv. (ln), GP Type, GP Not US-Based, Competition, Recession Indicator* and *Boom Indicator* (described in detail in the main part of this paper). Models 1-4 estimate the standard errors using Huber-White sandwich estimators (Huber, 1967). Model 3 further includes time-fixed effects at a year level. Model 4 also incorporates firm-fixed effects at a general partner level in addition to time-fixed effects. Model 5 shows an OLS regression with clustered standard errors at the GP level and further to include year dummies. Model 6 is a regression with two-way clustering on firm and year effects (Petersen, 2009). We show coefficients with their corresponding significance levels. *, ** and *** denote statistical significance at the 10%, 5% and 1% level, respectively. In parentheses we see the corresponding t-statistics.

	Pooled OLS					
	***GP IM* (ln)**					
Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
GP Drift Score	0.334**	0.243*	0.240*	0.281*	0.240*	0.243**
(ln (1 + GP Drift Score))	(2.540)	(1.909)	(1.914)	(1.824)	(1.835)	(2.450)
GP Age (ln)		0.019	0.012	0.145	0.012	0.019
		(0.509)	(0.317)	(1.535)	(0.277)	(0.389)
GP Invested Capital to Inv. (ln)		-0.021*	-0.014	-0.117***	-0.014	-0.021
		(-1.730)	(-1.192)	(-3.512)	(-0.998)	(-1.472)
GP Type (Dummy)		0.534***	0.431***		0.431***	0.534***
		(7.582)	(6.018)		(5.225)	(5.067)
GP Not US-Based (Dummy)		-0.325***	-0.145**		-0.145*	-0.325***
		(-6.545)	(-2.149)		(-1.906)	(-4.293)
Competition		-23.278***	-6.886	0.775	-6.886	-23.278***
		(-7.555)	(-1.526)	(0.139)	(-1.379)	(-3.256)
Public Market Control Dummies (Reference normal Year)						
Recession Indicator (Dummy)		0.097	-1.018*	-1.037**	-1.018*	0.097
		(1.269)	(-1.826)	(-2.027)	(-1.822)	(0.735)
Boom Indicator (Dummy)		-0.060	-1.246**	-1.172**	-1.246**	-0.060
		(-1.127)	(-2.313)	(-2.430)	(-2.298)	(-0.471)
Constant	0.604***	0.660***	1.551***	2.015***	1.551***	0.660***
	(21.375)	(6.377)	(2.969)	(5.216)	(2.977)	(4.082)
GP years	2799	2784	2784	2784	2784	2784
Year FE	NO	NO	YES	YES	YES	NO
PE firm FE	NO	NO	NO	YES	NO	NO
Clustering year level	NO	NO	NO	NO	NO	YES
Clustering PE firm level	NO	NO	NO	NO	YES	YES
R-squared	0.002	0.044	0.075	0.233	0.075	0.044

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

Table 2-8: Pooled OLS regression

Performance measures GP PME & GP IM – sorted by GP's private equity type

Table 2-8 reports the results from pooled OLS regressions of GP level PMEs (Models 1-3) and GP level IMs (Models 4-6) with style drift activity and other explanatory variables, split by fund managers' private equity type (buyout- and venture capital-oriented). It is therefore an extension of Table 2-5. The unit of analysis is a GP year (including all transactions conducted by a unique GP in a specific year). We use natural logarithms of *GP PME* and *GP IM* as dependent variables. All of the regressions apply a two-way clustering on firm and year effects (Petersen, 2009). The included explanatory variables are: *ln (1 + GP Drift Score), GP Age (ln), GP Invested Capital to Inv. (ln), GP Type, GP Not US-Based, Competition, Recession Indicator* and *Boom Indicator* (described in detail in the main part of the paper). Models 1 and 4 are equal to Model 6 in Tables 4 and 5. Models 2, 3, 5 and 6 have the same specification as models 1 and 2 (two-way clustering) and split our data sample in buyout- and venture capital oriented general partners (Models 2 and 5 = buyout-oriented; Models 3 and 6 = venture capitalists). We show coefficients with their corresponding significance levels. *, ** and *** denote statistical significance at the 10%, 5% and 1% level, respectively. In parentheses we see the corresponding t-statistics.

	Pooled OLS					
	***GP PME* (ln)**			***GP IM* (ln)**		
Variables	**Model 1 (all GPs)**	**Model 2 (only BO)**	**Model 3 (only VC)**	**Model 4 (all GPs)**	**Model 5 (only BO)**	**Model 6 (only VC)**
GP Drift Score (ln (1 + GP Drift Score))	0.270*** (2.900)	0.308*** (3.423)	-0.012 (-0.029)	0.243** (2.450)	0.277*** (2.776)	-0.115 (-0.290)
GP Age (ln)	0.028 (0.613)	0.023 (0.626)	0.012 (0.092)	0.019 (0.389)	-0.008 (-0.240)	0.057 (0.430)
GP Invested Capital to Inv. (ln)	-0.015 (-1.291)	-0.017 (-1.468)	-0.001 (-0.035)	-0.021 (-1.472)	-0.015 (-1.048)	-0.036 (-0.985)
GP Type (Dummy)	0.460*** (3.977)			0.534*** (5.067)		
GP Not US-Based (Dummy)	-0.087 (-1.484)	-0.080 (-1.360)	-0.141 (-0.771)	-0.325*** (-4.293)	-0.327*** (-4.848)	-0.353* (-1.897)
Competition	-4.127 (-1.054)	-1.320 (-0.495)	-32.716*** (-3.481)	-23.278*** (-3.256)	-19.542*** (-3.932)	-63.670*** (-7.382)
Public Market Control Dummies (Reference normal Year)						
Recession Indicator (Dummy)	0.012 (0.228)	0.121*** (2.602)	-0.297*** (-2.787)	0.097 (0.735)	0.208* (1.713)	-0.162 (-1.485)
Boom Indicator (Dummy)	0.011 (0.162)	-0.031 (-0.496)	0.178 (1.518)	-0.060 (-0.471)	-0.090 (-0.723)	0.074 (0.650)
Constant	0.084 (0.562)	0.518*** (5.344)	0.348 (0.994)	0.660*** (4.082)	1.167*** (10.815)	1.030*** (3.028)
GP years	2784	2184	600	2784	2184	600
Clustering year level	YES	YES	YES	YES	YES	YES
Clustering PE firm level	YES	YES	YES	YES	YES	YES
R-squared	0.025	0.006	0.029	0.044	0.034	0.068

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

Table 2-9: Pooled OLS regression – performance measures GP IM

Sorted by GP's private equity type & competition

Table 2-9 reports six pooled OLS regressions (Models 1-6) with the natural logarithm of *GP IM* as dependent variable. It shows the same analyses presented in Table 2-6 with *GP IM* as dependent variable instead of *GP PME*. Models 1-3 represent our subsample of investments conducted by buyout firms, and Models 4-6 our subsample of transactions by venture capitalists. We further split the respective subsamples by low and high private equity market competition (low <= median; high > median). The remaining Models 3 and 6 include an interaction term of competition and style drift score binary dummies. For all regressions the unit of analysis is a GP year (including all transactions conducted by a unique GP in a specific year); they estimate the standard errors using Huber-White sandwich estimators (Huber, 1967) and include year fixed- and PE firm fixed-effects. The explanatory variables included are: *ln (1 + GP Drift Score)*, *GP Drift Score* low/high Dummy, *Competition* low/high Dummy, the interaction term *Competition* (grouped) X *GP Drift Score* (grouped), *GP Age (ln)*, *GP Invested Capital to Inv. (ln)*, *Recession Indicator* and *Boom Indicator* (described in detail in the main part of the paper). We show coefficients with their corresponding significance levels. *, ** and *** denote statistical significance at the 10%, 5% and 1% level, respectively. In parentheses we see the corresponding t-statistics.

	Pooled OLS					
	***GP IM* (ln)**					
	Subsample BO			**Subsample VC**		
Variables	Model 1 (low competition)	Model 2 (high competition)	Model 3 (interaction comp. X drift)	Model 4 (low competition)	Model 5 (high competition)	Model 6 (interaction comp. X drift)
GP Drift Score (ln (1 + GP Drift Score))	0.081 (0.409)	0.444** (1.992)		-0.616 (-1.058)	1.107 (0.721)	
GP Drift Score (low/high Dummy)			-0.075 (-1.171)			-0.055 (-0.370)
Competition (low/high Dummy)			-0.236** (-2.471)			-0.008 (-0.026)
Competition (grouped) X *GP Drift Score* (grouped)			0.154* (1.761)			-0.013 (-0.042)
GP Age (ln)	0.272* (1.705)	0.295 (1.393)	0.131 (1.437)	-0.330 (-0.979)	0.205 (0.145)	0.087 (0.256)
GP Invested Capital to Inv. (ln)	-0.061 (-1.399)	-0.364*** (-4.429)	-0.136*** (-4.205)	0.239 (1.280)	-0.027 (-0.044)	-0.001 (-0.005)
Public Market Control Dummies (Reference normal Year)						
Recession Indicator (Dummy)	-1.248 (-1.496)	0.363 (1.271)	-0.055 (-0.145)	-3.396** (-2.085)	-0.965 (-0.952)	-2.927** (-2.227)
Boom Indicator (Dummy)	-2.986*** (-3.141)	0.120 (0.420)	-0.297 (-0.789)	-2.648* (-1.717)	-0.280 (-0.621)	-2.233* (-1.895)
Constant	1.863*** (5.148)	1.307*** (2.956)	1.447*** (6.370)	2.671*** (2.856)	0.935 (0.458)	2.036*** (2.844)
GP years	1028	1156	2184	407	193	600
Year FE	YES	YES	YES	YES	YES	YES
PE firm FE	YES	YES	YES	YES	YES	YES
R-squared	0.288	0.304	0.216	0.367	0.307	0.266

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

2. Essay 2: The return effects of industry relatedness in buyout-backed trade sales

Abstract

This paper investigates the return effects of industry relatedness between portfolio companies and their strategic acquirers in 656 buyout-backed trades. Differentiating between related (synergetic) and unrelated (lateral) buyers, we find that buyout fund managers generate higher returns with lateral trade sales. Our results suggest that lateral-specific acquisition objectives like market entry and information access outweigh synergetic-specific ones like efficiency gains, especially in situations when information asymmetry is high. We do not find evidence that either horizontal or vertical relatedness drives the return difference between synergetic and lateral trade sales in general, although this separation matters under certain circumstances. The investment duration, general partners' experience and public market conditions are factors determining these circumstances and thus moderating return differences of industry relatedness in buyout-backed trade sales.

Keywords: Private equity exits, buyout-backed trade sales, buyouts, trade sales, industry relatedness, public market equivalent

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2.1. Introduction

The core objective of buyout funds[58] is the generation of superior returns with their investments. The exit is therefore of utmost importance, because it determinates the overall success of an investment (Kaplan and Strömberg, 2009). A profound understanding of the exit situation and its return implications is essential (Schmidt et al., 2010). Of all buyout-backed exits, sales of portfolio companies to strategic acquirers (trade sales) have represented the globally dominant exit channel since 2008 (Bain & Company, 2017).

The field of potential strategic buyers is heterogeneous. Portfolio companies can be sold to acquirers from the same industry (horizontal), from related industries (vertical) or to buyers from other, unrelated industries (lateral) (Raudszus et al., 2014). But which strategic buyer fits best? And with which of them is the buyout firm maximizing its return? Strategies of value creation and business development should ideally be customized for the specific kind of buyer; however, strategies must be set long before the exit. To identify the 'optimal buyer' early is therefore an advantage for every buyout fund manager.

Despite this practical importance, there are relatively few studies about private to private transactions (Capron and Shen, 2007[59]) and especially little research about the return determinants in buyout-backed trade sales. The industry relatedness between a buyer and the portfolio company to be sold can be a crucial differentiator in this context (Barney, 1988; Bruner, 2004; Fan and Goyal, 2006; Rigamonti, 2012). According to a review of existing M&A literature conducted by Bruner (2002), relatedness between buyer and target represents an important return determinant in M&A transactions. The conclusion built on the findings of a group of studies is that acquisitions[60] of unrelated companies (lateral) tend to be associated with poorer performance than those of related firms (synergetic) (Bruner, 2002 with reference to, e.g., Berger and Ofek, 1995; Comment and Jarrell, 1995; Walker, 2000). Achleitner et al. (2014) investigate the role of industry relatedness in venture capital trade sales. Venture

[58] Also referred to as buyout-oriented general partner, buyout manager or buyout firm.
[59] Stated with reference to Chatterjee (1986), Singh and Montgomery (1987), Lubatkin (1987), Seth (1990).
[60] Or mergers.

capital, in contrast to buyouts, represents another type of private equity. Achleitner et al. (2014) find for those trade sales that higher returns for the selling general partners are achieved with sales to lateral rather than to synergetic (horizontal or vertical) buyers. They state that the willingness of an acquirer to pay depends on different strategic objectives and levels of available information (Achleitner et al., 2014). It can be assumed that information asymmetry increases with decreasing relatedness (Achleitner et al., 2014). The different strategic objectives of lateral and synergetic acquisitions are documented in M&A literature. While lateral acquisitions are often conducted to enter a new market (e.g., Trautwein, 1990), diversify the existing business (e.g., Martin and Sayrak, 2003) or to gain access to industry-specific information (Zhu and Jog, 2009; Achleitner et al., 2014), synergetic acquisitions are usually motivated by an anticipated increase in market power (Haleblian et al., 2009) or in efficiency (e.g., Coase, 1937; Villalonga and McGahan, 2005).

In this paper we transfer these aspects to the field of buyout backed trade sales. Achleitner et al.s' (2014) findings illustrate a first indication that private equity trade sale returns are in line with M&A literature. Lateral buyers either overpay for targets because they suffer from information asymmetry, or they pay higher prices due to fundamentally different strategic objectives, which they value higher than synergetic buyers. The higher prices could subsequently lead to poorer returns for the buyers. Since buyout-backed trade sales are fundamentally different from venture capital exits or general M&A transactions, an analysis of this special exit channel complements the existing findings. Buyers of buyout-backed companies find special situational conditions. The portfolio companies were optimized over the course of buyout firm ownership in terms of profitability, efficiency and strategy. Other than in venture capital trade sales the companies are bigger and well established. The optimization was conducted on an existing fundamental and was often necessary. In addition, the reputation of the selling general partner can give buyers confidence in the quality of this optimization process. This preceding optimization by professionals is not given in traditional M&A transactions. Compared to venture capital trade sales, the difference is even stronger.

Venture capital backed companies are young firms, which can be interesting for buyers, because they offer innovation, new technology or dynamic teams. Acquirers of buyout backed companies, in contrast, aim for optimized, established firms operating in strategic industries and/or offering interesting expansion or synergy potentials. These situational conditions in buyout backed trade sales are the reason the strategic objectives of buyers are special. The role of information asymmetry is the other reason for relatedness-driven return differences in trade sales (Achleitner et al., 2014). And again, the situation in buyout-backed trade sales differs. We expect that the degree of information asymmetry is less distinctive in the context of old and established firms. Compared to venture capital, the impact of available information should be therefore less strong.

Based on the importance of trade sales in private equity, the special situational conditions of buyout exits, the role of relatedness as a driver of return differences and the lack of theoretical and empirical research in this field, we analyze the return effects of industry relatedness in buyout-backed trade sales. We differentiate between lateral and synergetic, as well as between lateral, vertical and horizontal buyout-backed trade sales. We further look at three potential moderating effects. First, we investigate the role of the time the portfolio company is under private equity ownership until the time of the exit (holding period/ investment duration). Second, we analyze the experience of the selling general partner in the context of return differences in buyout trade sales. Third, we examine the moderating effect of public market conditions at the time of the exit.

Our proprietary sample comprises 656 unique buyout-backed trade sales conducted by 134 buyout fund managers between 1980 and 2013. The data stem from due diligence processes of three fund-of-funds (limited partners) and contain also investment information from buyout funds in which the limited partners had not invested in the end. This reduces the threat of selection bias in our sample. We enriched the sample with information from several private equity databases. Among other investment information our data incorporates monthly gross

cash flows between general partners and their portfolio companies. This enables us to make a very precise deal-level performance measurement, which is rare in private equity research. We choose the public market equivalent (PME) to measure the return of an exit. Doing so, we ensure the benchmark to investments in public equity markets and thereby a certain risk adjustment (Sorensen and Jagannathan, 2015). We further measure industry relatedness with a classification approach that is based on industry commodity flows information and Input-Output (IO) industry codes (Fan and Lang, 2000; Fan and Goyal, 2006). This measurement overcomes shortcomings of SIC based relatedness measures, like the inaccuracy in the identification of vertical relatedness (Fan and Lang, 2000; Fan and Goyal, 2006). To our knowledge, this paper is the first to analyze the return effects of industry relatedness in buyout-backed trade sales. We ensure validity of our investigation using comprehensive and detailed deal-level data, a robust private equity performance measure (Sorensen and Jagannathan, 2015), and a precise measure of industry relatedness (Fan and Lang, 2000; Fan and Goyal, 2006).

We find significant evidence that buyout managers generate higher returns in trade sales if they sell to lateral rather than to synergetic buyers. Less industry relatedness seems to be an argument for paying higher prices. The observed difference is especially high when the investment duration of the general partner in the respective portfolio company is short, when the selling fund manager is less experienced or when public market conditions are less favorable. We conclude that lateral-specific acquisition objectives like market entry and information access lead to a willingness to pay more. Further, we argue that long investment durations and more experience of the selling fund manager contribute to the familiarity and the available information base of the company to be sold. These aspects improve the information disadvantage of lateral buyers and lead to an assimilation of bidding prices in trade sales in those situations. Concerning public market conditions, our results suggest that during boom periods similar returns can be generated from synergetic and lateral buyers, because an increased deal competition leads to an assimilation of bidding prices. Less

favorable public market conditions instead reveal the return differences of industry relatedness, because differentiating factors like strategic acquisition objectives or levels of information asymmetry matter more under those conditions.

The observed main effect is congruent with the findings for venture capital trade sales of Achleitner et al. (2014). Overall, we contribute to the existing literature and prove that industry relatedness is not only an important determinant of investment returns in venture capital (Achleitner et al., 2014), but also in buyout-backed trade sales.

This paper is structured as follows: Section 2 describes our motivation and the derivation of our hypotheses; Section 3 outlines our methodology; Section 4 presents our sample and variables; Section 5 shows our descriptive statistics and the results of our multivariate analyses; Section 6 discusses our findings for buyout backed-trade sales and compares them with venture capital trade sales; and Section 7 concludes.

2.2. Motivation and hypotheses

2.2.1. Motivation

The relatedness hypothesis (Barney, 1988) states that relatedness between acquiring and target firms can create value. Early research delivers inconsistent results testing this hypothesis. For example, Lubatkin (1987) finds no significant difference in returns to the acquirer between related and unrelated buyer-target pairs (Barney, 1988). On the other hand, Markides and Ittner (1994) find that related acquisitions lead to value creation. Bruner (2002) summarizes current scientific knowledge including more recent findings. He comes to the conclusion that there is a positive relationship between the relatedness of buyers and targets and the returns in M&A transactions (Bruner, 2002 with reference to, e.g., Berger and Ofek,

1995; Comment and Jarrell, 1995; Walker, 2000). Overall, the effect of relatedness on the success of an acquisition seems to be complex and situation-dependent (Bruner, 2004).

For the special environment of private equity exits, recent research analyzes industry relatedness in the context of venture capital transactions. Achleitner et al. (2014) find a significant impact of industry relatedness in trade sales on the investment return of venture capitalists. More precisely, the investment rate of return (IRR) of lateral trade sales is higher than that of synergetic trade sales. Dividing the sample according to the development stage of portfolio companies, this effect is only significant for the trade sales of early stage portfolio companies. Achleitner et al. (2014) connect these findings with the theory of information asymmetry. The results suggest that venture capital returns are higher if information asymmetry between seller and buyer is higher (in the cases of lateral trade sales and early stage target companies). Assuming that lateral buyers overpay for targets, which could be a reason for poorer returns in the view of a buyer, the findings are in line with M&A literature.

Buyout-backed trade sales are a special transaction type and circumstances as well as motivations deviate from classical M&A and venture capital transactions. Therefore, an investigation of return effects of industry relatedness in buyout-backed trade sales should enhance the current scientific knowledge.

Since the role of information asymmetry is less distinct in buyout-backed trade sales, the reasoning that lateral buyers suffer from information disadvantages could be less relevant than in venture capital exits. By definition, buyout firms sell mature and established firms. Information about them is more accessible than for young ventures. Lateral buyers should have less problem evaluating buyout-backed targets. However, based on the fact that buyout-backed companies are usually not publicly traded and/or buyout managers are governed by fewer regulations than common in public markets, information asymmetry should be higher than in normal M&A transactions (including for a publicly traded firm). Consequently, we

argue that the role of information asymmetry in buyout trade sales is less important than in venture capital exits but is more influential than in normal M&A.

Differences between the venture capital and the buyout environment can further stem from fundamental differences between strategic objectives of buyers of buyout and venture capital backed companies. Buyers in buyout-backed trade sales search for companies that have been optimized in profitability, efficiency and strategy. Their rationale is the acquisition of optimized, established firms operating in strategically important industries/markets and/or offering interesting expansion or synergy potentials. In contrast, acquirers of young ventures are interested in access to innovative teams or technologies.

Strategic objectives for the acquisition of buyout backed firms should also differ from those in classical M&A. The former ownership of a buyout firm could signal the quality of a target. Buyers could assume that the portfolio company has been strategically and financially optimized by a qualified buyout manager. This could be especially interesting for lateral buyers, because they might not have the capabilities to conduct such an optimization on their own.

These special situational conditions in buyout-backed trade sales lead us to the assumption that industry relatedness might drive return differences in buyout-backed trade sales other than in classical M&A deals or venture capital trade sales. We expect that the investigation of this question in the context of the most important private equity type category[61] (buyouts) can contribute to a better understanding of the impact of relatedness on returns in private equity trade sales.

2.2.2. Return differences of industry relatedness in buyout-backed trade sales

As a starting point, we predict that the industry relatedness between the buyer and the portfolio company has an impact on the return potential of buyout trade sales. To investigate

[61] Measured by capital raised and dry powder buyouts/buyout funds/buyout capital represent the dominant type in private equity (Bain & Company (2016)).

this relationship we distinguish between lateral and synergetic exits (Achleitner et al., 2014). The latter can be subdivided into vertical and horizontal trade sales. In a lateral trade sale the buyer and the portfolio company (to be sold by the buyout firm) operate in completely unrelated industries. In synergetic trade sales buyer and target do business in the same (horizontal) or related (vertical) industries. Whether a buyer conducts a lateral or a synergetic acquisition depends on strategic considerations. Here, two factors set the frame for the price the buyer is willing to pay and thus for the return the buyout firm can generate. First, the estimated strategic value of the acquisition for the buyer (Lubatkin, 1987; Capron and Shen, 2007; Achleitner et al., 2014), and second, the level of company- and industry-specific information available to her for the evaluation of the acquisition (Capron and Shen, 2007; Achleitner et al., 2014).

To see the different strategic values for acquisitions, we contrast synergetic- with lateral-specific ones. We want to understand whether there are differences that could explain a higher willingness to pay for an acquisition. We start with a general discussion of synergetic- and lateral-specific aspects of acquisitions and interpret their relevance in buyout-backed trade sales afterwards.

The first synergetic-specific strategic acquisition objective could be the increase of market power of the combined company (Seth, 1990; Haleblian et al., 2009). There are several ways that such an increase can look. First, lowering competition by acquiring a competing company could lead to more market power in setting prices (Seth, 1990; Haleblian et al., 2009). Further, an acquisition can increase the purchasing power of the combined new company and thus increase its market power. In this context, fewer players can facilitate collusion in a specific industry and can make the industry less competitive (Shenoy, 2012). Collusion is reported in the context of horizontal (Eckbo, 1983) as well as of vertical acquisitions (Chen, 2001; Nocke and White, 2007; Shenoy, 2012). Second, an acquisition can lead to foreclosure effects. The combined new firm may have more power to deny the exchange of critical input

or output to other companies in the same or connected industries (Salinger, 1988; Hart et al., 1990; Ordover et al., 1990; Shenoy, 2012). Foreclosure can lead to the weakening of competing firms and in extreme cases to their exits from the market (Shenoy, 2012). While these effects are bad for customers, suppliers or competitors, they could be desirable for the acquiring firm and can therefore lead to higher bids offered to the general partner who is selling.

The second synergetic-specific objective of an acquisition could be the generation of efficiency gains. Firms from similar or same industries operate with similar resources and apply similar processes. This degree of relatedness provides opportunities for efficiency gains, cost reductions and economies of scale (Coase, 1937; Seth, 1990; Villalonga and McGahan, 2005; Shenoy, 2012; Cefis et al., 2015). These gains can be generated through a reduction of transaction costs, a straightforward access to resources and scaling effects from increases of production output. We expect acquiring firms from the same or similar industries (synergetic) to gain more from these efficiency, cost and scale advantages than acquirers from unrelated industries (lateral).

On the other hand, there are also lateral-specific aspects of acquisitions that can lead to a high strategic value and therefore to a higher willingness to pay for targets. The first aspect is the market entry that is enabled by the acquisition. Given an attractive market with high entry barriers an acquisition can be a fast and easy way to enter that market/industry (e.g., Trautwein, 1990; Martin and Sayrak, 2003; Cloodt et al., 2006; Rigamonti, 2012; Achleitner et al., 2014). This function of an acquisition is particularly strong for lateral buyers which are not already active in the industry of the portfolio company to be sold.

A lateral acquisition leads as well to diversification and thereby to value creation potential. One important objective of a diversification strategy is often to acquire cash flows which are imperfectly correlated to those from the original business (Bruner, 2004). This in turn has the potential to reduce the overall risk of the company and can help it to be more stable during recession times (Martin and Sayrak, 2003). Other potential advantages of diversification stem

from economies of scope (Seth, 1990; Cefis et al., 2015). Excess capacity in capabilities and resources of the combined firm have potential to be utilized in value-creating ways (Martin and Sayrak, 2003). Good examples are innovation-fostering knowledge transfers between unrelated businesses or positive financing effects of the combined company (Bruner, 2004; Miller et al., 2007). The diversification aspects of an acquisition are again lateral-specific and can lead to a higher willingness to pay by lateral buyers.

In conclusion, there are strategic reasons for lateral as well as for synergetic acquisitions. While some M&A research reports no effect or a negative performance effect of the market power argument in acquisitions (Bruner, 2002 with reference to, e.g., Eckbo, 1992), we argue that market power can generate a certain advantage in the industries/markets of buyout-backed companies. This is because buyout capital is often invested in niche industries/markets, where market power is easier to increase. Consequently, the market power objective for synergetic buyers stays valid in buyout-backed trade sales.

Concerning the efficiency gains, which should be easier to reach for synergetic buyers, we assume that their potential is rather weak in the context of buyout trade sales. It is likely that the respective portfolio companies have already been optimized by the private equity firms (profitability, efficiency) and that potential gains could be limited to the buyer company side. Therefore, we assume that the efficiency gain argument for synergetic buyers is rather weak.

Turning to the lateral-specific acquisition aspects like market entry and diversification, we think that the market entry objective is especially relevant for buyers of buyout-backed companies. As already mentioned, they are often active in niche industries/markets where entry can be tough. Furthermore, the companies were often optimized by buyout managers and this can be of special interest to lateral buyers, who might not be able to conduct a strategic or efficiency optimization in the new market/industry.

The diversification objective can be present for all types of lateral transactions. It could therefore also hold for lateral buyers in buyout trade sales. However, the performance effect of diversification is discussed in the M&A literature as controversial (Bruner, 2004). In

general, research reports rather a negative effect (Bruner, 2002 with reference to, e.g., Berger and Ofek, 1995). Therefore, we assume that this acquisition objective has less weight.
Because there are strategic acquisition objectives for lateral as well as for synergetic buyers, which can lead to higher willingness to pay in buyout-backed trade sales, we cannot hypothesize a return effect based on strategic considerations only.

As a result, we consider differences in the level of information asymmetry between lateral and synergetic buyers (Achleitner et al., 2014). In general, information asymmetry is higher in lateral than in synergetic trade sales. If buyer and target operate in the same or a related industry the acquirer normally has industry insights and an advantage in business judgment. She can use this industry knowledge to reduce her information asymmetry. We follow the argument of Achleitner et al. (2014) that information asymmetry has two opposite effects on the acquirer's willingness to pay in a private equity trade sale. On the one hand, an acquirer prefers low information asymmetry, because it comes along with lower transaction costs (e.g., costs for due diligence) and with a lower probability of decision errors (Capron and Shen, 2007). By implication, high information asymmetry should have a negative effect on the bidding price in this context, because the potential acquirer has higher transaction costs and faces higher risk with the acquisition. But as already mentioned, buyout-backed companies are usually mature and established firms. Disadvantages from information asymmetries should be less distinct in buyout-backed trade sales in comparison to venture capital deals.
On the other hand, a lateral buyer with higher information asymmetry also has a higher information gain from the acquisition. If this information gain is difficult to reach without an acquisition and if the accompanying information has strategic value, a lateral buyer can have a greater willingness to pay compared to a synergetic acquirer (Zhu and Jog, 2009; Achleitner et al., 2014). Achleitner et al. (2014) note in this context that the information access argument could be especially high in venture capital trade sales because the usual portfolio companies have innovative and disruptive business models. However, the information access objective can also be relevant in trade sales of buyout-backed portfolio companies. These targets have

been polished in terms of efficiency and business model orientation while in private equity ownership and therefore offer potential for information gain. Nevertheless, compared with venture capital trade sales we expect that this argument is also less persuasive because buyout-backed portfolio companies are by definition more established.

As we have discussed, it is difficult to hypothesize return differences of industry relatedness in buyout-backed trade sales based on lateral- and synergetic-specific acquisition objectives. Both types of buyers have reasons for a greater willingness to pay. The discussion of different levels of information asymmetry of both buyer groups delivers an inconclusive picture as well. While synergetic buyers should gain from lower information asymmetry, lateral buyers have more potential gain from information access; both arguments seem less relevant in buyout than in venture capital deals. Although we cannot estimate which buyer group shows the higher willingness to pay in buyout-backed trade sales, we note that there is a huge potential for differences between them. We therefore formulate a non-directional hypothesis:

Hypothesis 1: Investment returns of buyout-backed trade sales are different if the portfolio company is sold to a lateral rather than a synergetic buyer.

Differentiating within synergetic trade sales between horizontal and vertical acquisitions one can argue that the efficiency and cost benefits as well as economies of scale are greater the more related the companies are (Coase, 1972; Villalonga and McGahan, 2005). This assumption would indicate that acquiring firms from the same industry as the portfolio company would pay more than vertical buyers. On the other hand one can notice that vertical buyers profit from a reduction of resource dependence (Pfeffer, 1972; Haleblian et al., 2009) more than horizontal acquirers. This in contrast would imply that vertical buyers pay more. Again, the efficiency gains should be limited in the case of already optimized targets. Therefore, we assume that the strategic value of vertical buyers in buyout trade sales overweighs that of horizontal buyers.

Concerning information asymmetry, the two types of buyers differentiate themselves as well. In the case of horizontal trade sales we assume that the level of information asymmetry is lower than in vertical trade sales. We apply the same argument as in the comparison between lateral and synergetic acquisitions. Horizontal buyers could gain from less information asymmetry and vertical buyers from more information access.

Since the comparison of different levels of available information is again inconclusive, we base our hypothesis on the difference in potential strategic values. Because resource dependence advantages for lateral buyers could outweigh efficiency gains for horizontal buyers in the case of buyout backed companies, we hypothesize:

Hypothesis 2: Comparing private equity backed investment returns of horizontal and vertical trade sales with lateral deals, respectively; the return differences are stronger in the horizontal/lateral comparison.

2.2.3. Factors moderating return differences of industry relatedness in buyout-backed trade sales

We expect that the influence of industry relatedness in buyout backed trade sales is moderated by other factors. Again, we can build on the findings of Achleitner et al. (2014). They analyze three levels of moderating factors: 1.) on the company level, the development stage of the portfolio company, 2.) on the general partner level, the experience of the venture capitalist and 3.) on the market level, the specific market environment for venture capital exits (Achleitner et al., 2014). As the statistical results of Achleitner et al. (2014) prove their approach, we apply the same structure of moderation levels. However, we alter the single moderating factors for each level so that they match the requirements of the buyout-specific environment we investigate in this paper. In the following we discuss the holding period of a portfolio company, the experience of the general partner and the public market conditions at the time of the trade sale as moderating factors.

Holding period The holding period (investment duration) is the time that the general partner is invested in a portfolio company. The median holding period for private equity investments is roughly six years (Kaplan and Strömberg, 2009[62]). Logically, the individual investment duration can vary greatly. Existing literature discusses the influence of the holding period on return differences in private equity investments.

On the one hand, there is the value-adding argument stating that a general partner needs some time to create value for the portfolio company (Cumming and MacIntosh, 2003b; Kreuter et al., 2005; Schmidt et al., 2010). Consequently, short holding periods would signal less progress and would lead to a negative effect on exit returns. For synergetic buyers this could mean that there is more room for efficiency gains. For lateral buyers this could be a disadvantage, because they could appreciate an optimization already conducted by the general partner. There is, however, another theory about short holding periods. Kreuter et al. (2005) find evidence that so-called 'buy-and-flip' strategies could lead to higher returns, because most of the value in buyout transactions is created upfront. In our discussion, this agreed with the perspective of lateral buyers, because their market entry and information access objectives are also given after a short holding period of the general partner.

On the other hand, excessive holding periods could signal a low quality of the portfolio company because the general partner is not able to exit the investment (Cumming and MacIntosh, 2003b; Cumming and MacIntosh, 2003a; Schmidt et al., 2010). This in turn could lead to a negative impact on exit returns, which is relevant for both lateral and synergetic trade sales. Another possible aspect of long holding periods is the potential to reduce information asymmetry, because buyers have the opportunity to observe the development of the portfolio company under the ownership of the buyout manager[63]. We infer that longer holding periods should improve the information availability of lateral buyers and could lead to information assimilation between lateral and synergetic buyers to a certain extent.

[62] Kaplan and Strömberg (2009) analyze 17,171 LBO transactions conducted between 1970 and mid-2007.
[63] Argument is inspired by the papers of Cumming and MacIntosh (2001) and Cumming and MacIntosh (2003a) for investment durations in venture capital.

Therefore, we expect that the effect between trade sale types (lateral versus synergetic) and exit returns is more pronounced in buyout investments with shorter holding periods. This is because the market entry and information access arguments are less counterweighted with the information asymmetry argument after shorter investment durations. We hypothesize:

Hypothesis 3: A shorter investment duration of a buyout firm in a portfolio company has a pronounced impact on the return differences of industry relatedness in private equity backed trade sales.

General partners' experience On the private equity firm level the experience of the general partner is likely to be a moderating factor for the relation between industry relatedness and returns in buyout backed trade sales. Private equity firms are professional investors who try to create value for their portfolio companies. Most of their skills and tools are developed over time and therefore experienced general partners have superior abilities to improve their portfolio companies (Kreuter et al., 2005). Usually private equity managers offer financial support (Schmidt et al., 2010) and specialized industry as well as operational know-how (Kaplan and Strömberg, 2009; Schmidt et al., 2010) to their portfolio companies. Furthermore, they apply financial engineering (Kaplan and Strömberg, 2009; Schmidt et al., 2010). General partners try also to alter the corporate governance of their portfolio companies in a value-creating way. Usual approaches are special incentives for the management (Kaplan and Strömberg, 2009; Schmidt et al., 2010), mentoring (Das et al., 2003) and a strict monitoring (Kaplan and Strömberg, 2009). The value creating approaches can lead to real value creation and therefore to the desired return at the time of the exit. Not least, a general partner develops a large network and reputation over time that can be useful during the selling process. Buyers would rather believe a well-connected and reputable general partner that her portfolio company to be sold is of high quality (Gompers, 1996; Achleitner et al., 2014). High experience has consequently value increasing potential, hence the experience of a general

partner should influence return effects of industry relatedness in private equity backed trade sales.

With Hypothesis 1 we predict that buyout firms generate different returns from sales to lateral or synergetic buyers. In the context of experience, we think that experienced general partners use their reputations and networks to promote their portfolio companies (Achleitner et al., 2014). Furthermore, they usually have improved value creation skills and their experience signifies the quality of their portfolio companies. In sum, high experience can help reduce information asymmetry which should normally be higher for lateral buyers. Therefore, we expect an assimilation of bidding prices between lateral and synergetic buyers when the experience of the selling general partner is high. By implication, return differences based on industry relatedness in trade sales should be especially pronounced when general partner experience is low:

Hypothesis 4: Return differences of industry relatedness in private equity backed trade sales are more pronounced if general partners' experience is low.

Public market conditions On the external environment level, we expect that public market conditions at the time of the exit have a moderating effect on return differences in buyout-backed trade sales. Significantly more acquisitions are conducted during boom cycles of the economy (Bouwman et al., 2009). In such times companies have money and power to expand into new industries (lateral) or to foster their positions in their markets (synergetic). Furthermore, we expect that they have more competition on the buyers' side from other investors, for example from other private equity funds (secondary transactions). Altogether, it can be assumed that there is more investment pressure in times of favorable public market conditions.

As discussed above, the return of trade sales to general partners depends on the willingness to pay of potential buyers. During favorable market conditions, with high investment pressure, there are a lot of parties interested in buying portfolio companies from general partners. We expect that differences in industry relatedness weigh less during those times. Due to relatively high price levels and a certain competitive pressure to catch up, an assimilation in the willingness to pay of all buyer groups is likely. In contrast, there is less M&A activity during times of less favorable market conditions (Bouwman et al., 2009). Here, differences in available information and strategic acquisition value potentials, which differentiate lateral and synergetic buyer groups, should carry more weight. We therefore hypothesize:

Hypothesis 5: Less favorable public market conditions at the time of the trade sale influence the buyout firms' return differences between lateral and synergetic trade sales.

2.3. Methodology

2.3.1. Definition of transaction types

Most private equity funds are structured as limited partnerships, which are closed-end funds. This means that limited partners commit their capital to a fund for a fixed period of time during which they are not allowed to withdraw their money (Talmor and Vasvari, 2011, p. 27-28). Over this investment period the fund tries to realize profits by buying, optimizing and selling companies (portfolio companies). After the termination of the fund, limited partners receive their initial capital plus or minus a positive or negative return (depending on the success of the fund investments). Consequently, the decision to sell (exit) a portfolio company is a crucial part of the private equity investment cycle. At this, the general partner has several exit options: Trade sales, secondary sales, buy-backs or IPOs. In the worst case, there is also the option to write off the investment (Schmidt et al., 2010). In this paper we focus on the first option, exit by trade sale. A trade sale is a disposal of the portfolio company to a strategic

buyer. According to the Global Private Equity Report 2017, published by Bain & Company, Inc., sales to strategic buyers have been the globally predominant exit channel for buyout-backed portfolio companies since 2008 (Bain & Company, 2017). With a focus on trade sales we further differentiate among three types of strategic acquisitions: horizontal, vertical and lateral acquisitions (Raudszus et al., 2014). The classification is dependent on the existing business relations between the acquiring firm (buyer) and the portfolio company. If the general partner sells the portfolio company to a strategic buyer active in exactly the same industry as the portfolio company, we call it a "horizontal" acquisition. If both of them operate along the same value chain, e.g., the portfolio company is a supplier of the acquiring firm, it is a "vertical" acquisition. An acquisition is called "lateral" if both companies are active in completely different industries. Together, horizontal and vertical acquisitions are called "synergetic" acquisitions. Synergetic transactions, then, include any industry relationship within a target-buyer pair and can be compared to lateral acquisitions.

2.3.2. Operationalization of horizontal, vertical and lateral trade sales

We classify trade sale types using the industry relatedness between the acquiring firm and the portfolio company sold by the general partner. There are several ways to measure industry relatedness. One traditional way is based on standard industrial classification (SIC) codes and defines the relatedness of two companies by comparing their SIC codes within the pre-defined hierarchical SIC structure. However, there is rising criticism of these kinds of industry relatedness measures (e.g., Fan and Lang, 2000; Fan and Goyal, 2006). The most important concern is the liability to classification errors. This is made clear by the identification of vertical related companies (Fan and Lang, 2000; Fan and Goyal, 2006), because the measurement of this relatedness type in a more and more complex business environment is challenging.

To overcome the mentioned shortcomings we apply a step-by-step classification approach that is based on industry commodity flow information and Input-Output (IO) industry codes.

In a first step, we classify acquisitions as horizontal if buyer and target companies share the same IO industry (Fan and Goyal, 2006)[64].

In a second step, following the concepts of Fan and Lang (2000) and Fan and Goyal (2006), we identify vertical relatedness between buyer-portfolio company pairs. According to this approach, two companies are vertically related if they have the potential to use input or supply output from each other (Fan and Lang, 2000). The extent of this dependency is measured with vertical relatedness coefficients on an industry level. Suitable for the mergers and acquisitions (M&A) context, the use of industry-level data allows for the identification of potential vertical relatedness or integration. A buyer-portfolio company pair does not have to trade vertically; the coefficient just measures the potential vertical relatedness between the buyer and the portfolio company industries (Ahern, 2012). Fan and Langs' (2000) calculation of the coefficients is based on the "Use Table" of Benchmark Input-Output Accounts for the US economy provided by the Bureau of Economic Analysis[65]. This table is a matrix of industries and shows commodity flows among them measured by their USD value. For each pair of industries *i* and *j*, it lists a_{ij}, the dollar amount of *i's* output that is needed to produce industry *j's* total output (Fan and Lang, 2000; Fan and Goyal, 2006; Hendricks et al., 2009). Dividing a_{ij} by industry *j's* total output, one gets v_{ij}. This is the value of input from industry *i* used to produce 1 USD of output of industry *j*. The calculation of v_{ji} is exactly the other way around (Fan and Lang, 2000). Hendricks et al. (2009) recognize "that v_{ij} and v_{ji} can interpreted as forward and backward relatedness coefficients, respectively" (Hendricks et al., 2009, p. 239). Given that interpretation, we follow the vertical relatedness coefficient calculation of Fan and Goyal (2006):

$$V_{ij} = max\left\{v_{ij}, v_{ji}\right\}$$

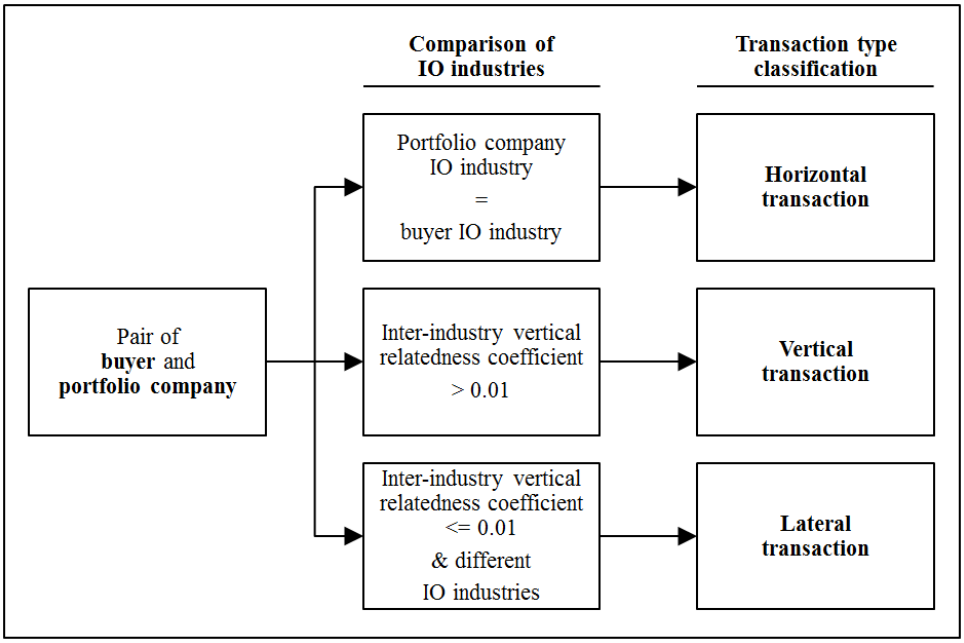
[64] This is the same approach with SIC codes used by Shenoy (2012) and Achleitner et al. (2014).
[65] Prepared by the Industry Economic Accounts (IEAs) Directorate, Bureau of Economic Analysis (BEA), US Department of Commerce.

where V_{ij} is the vertical relatedness coefficient of industries *i* and *j*. It "measures the opportunity for vertical integration between industries *i* and *j*" (Fan and Goyal, 2006, p. 881). We mark a transaction as vertical if the vertical relatedness coefficient between the industry of the acquiring firm and the industry of the portfolio company is greater than 1% (also used by Fan and Goyal (2006)[66])[67].

In a last step we identify lateral transactions. We define a transaction as lateral if the acquiring firm and the portfolio company neither operate in the same industry nor show vertical relatedness (Fan and Goyal, 2006[68]).

Figure 2-2 illustrates our step-by-step classification approach to identify horizontal, vertical and lateral trade sales.

Figure 2-2: Trade sale type classification approach



[66] Fan and Goyal (2006) also apply a 5% threshold, but their definition of pure vertical relatedness is based on a threshold of 1%.
[67] Fan and Goyal (2006) note that a percentagewise small threshold has an economically large impact.
[68] Our definition of lateral transactions is similar to the 'conglomerate mergers' of Fan and Goyal (2006).

2.4. Data and variables

In this section we present the sample and the variables we use in the multivariate analysis. We start in Section 4.1 with a detailed description of our data collection process. Section 4.2 shows the composition and characteristics of our sample and Section 4.3 contains short explanations of all variables.

2.4.1. Sample collection

Our proprietary sample consists of 656 unique buyout-backed trade sales conducted by 134 buyout fund managers[69]. We collect the data from several sources. The core information stems from three fund-of-funds (limited partners), which have received the data in the course of their due diligence processes directly from general partners. Besides investment and exit dates and other general investment information this data incorporates monthly gross cash flows (before carried interest and management fees) between general partners and their portfolio companies. The latter is rare in private equity research because of the private nature of this asset class. It allows us to measure deal-level investment performance on a very precise level. Furthermore, our sample collection reduces the threat of selection bias, because the fund-of-funds provide us investment information from all their due diligences and not only from those that lead to investments of the fund-of-funds in the respective general partner funds.

To end up with our 656 buyout trade sales, we reduce the total sample received from the fund-of-funds according to several exclusion criteria to ensure data quality and completeness. First, we correct the data for double counted transactions which are incorporated because the data stems from several sources. Second, we exclude follow-on investments and those conducted in the scope of pre-funds. The exclusion of follow-on investments is reasonable because they duplicate investment information and rationale (Gompers et al., 2008; Achleitner et al., 2014).

[69] In our discussion we also analyze 234 venture capital trade sales. The collection of information about the venture capital deals is equivalent to the collection process described in this section.

Further, the exclusion of pre-fund information is necessary to ensure data validity, which we do not consider as given for pre-funds. Third, we exclude exits with incomplete data such as missing exit dates or cash flows. Further, we incorporate in our sample only trade sales that are completely or partially exited by general partners. Obviously, we can only get buyer information for these exits and, thus, analyze exit situations.

Since the data from the fund-of-funds include no industry information about buyer and portfolio companies, or the information is incomplete, we match it from three databases (Capital-IQ, ThomsonOne and Pitchbook[70]). We exclude all data records for which we are not able to get industry information. We further exclude exits to financial buyers[71] (Achleitner et al., 2014) and exit channels other than trade sales (e.g., IPOs, buybacks or write-offs).

In the last step we use the fund type classification from Pitchbook to detect buyout-backed trade sales. We select deals as buyout trade sales if their Pitchbook fund type classifications are equal to "Buyout" or "PE Growth-Expansion". We also include deals from the fund types "Diversified Private Equity", "Energy – Oil & Gas" and "Restructuring/ Turnaround" if the corresponding Pitchbook investor types of the general partners responsible for the funds are equal to "PE/Buyout" (and not as "Venture Capital" investors)[72].

This adjustment process leads us to our final sample of 656 buyout backed trade sales. The next section presents the sample description.

2.4.2. Sample description

We start the description of our sample on a general partner level. Table 2-10 shows the characteristics of the 134 buyout firms that conducted the trade sales we investigate in this paper. At the time of the exit, a general partner in our sample was at the median 21 years old, had executed three trade sales before and had invested USD 76.5 million in portfolio

[70] The information was preferred matched according to the order of databases.

[71] As in Achleitner et al. (2014) we define financial buyers with the aid of their four-digit SIC classification, which has to equal 6799.

[72] For the selection of the venture capital subsample used in our discussion part we used the Pitchbook fund type classifications "Venture Capital" and "Venture Capital – Early Stage".

companies that were exited by trade sales. The median founding year of a buyout firm is 1990.

Table 2-10: Descriptive sample statistics on general partner level

Table 2-10 shows descriptions of the 134 buyout management firms in our sample. The table provides medians of founding year, GP age, number of total trade sales and total capital invested in millions of USD. GP age is calculated on deal level. Panel A categorizes the buyout firms by their experience. We use GP age as a proxy for experience and divide the sample by the median calculated on the trade sale level (21 years). Panel B shows our sample of GPs by size, and Panel C by region (headquarters location). We use the total capital invested in portfolio companies that were exited by trade sales as a proxy for size.

			Median			
	Obs. #	Obs. %	Year founded	GP age [years]	# of trade sales	Total capital invested in TS [m USD]
All GPs	134	100%	1990	21.0	3.0	76.5
Panel A: GP experience [by age]						
Less experienced	98	73%	1994	14.0	2.5	63.0
More experienced	36	27%	1982	29.0	4.0	178.3
Panel B: Size						
1st quantile total cap. inv.	34	25%	1994	15.0	1.0	12.6
2nd quantile total cap. inv.	33	25%	1992	18.0	2.0	45.6
3rd quantile total cap. inv.	34	25%	1990	21.5	3.0	140.9
4th quantile total cap. inv.	33	25%	1985	32.0	8.0	702.0
Panel C: Region						
US-based	66	49%	1990	19.5	3.0	111.1
Not US-based	68	51%	1991	22.0	2.0	49.6

Panels A and B split our sample according to general partners' experience and size at the time of an exit. Both characteristics are often discussed in private equity literature (e.g., Cumming et al., 2009). We use the age of a general partner as a proxy for her experience. As we can see in Panel A, 73% of all buyout managers are categorized as less experienced and 27% as more experienced. We cut the sample by the median value of age (21 year) calculated on the trade sale level; this is why we do not end up with equal-sized subsamples. Furthermore, we use the total capital invested in portfolio companies that ended up in trade sales as a proxy for the size of a general partner. The median values in Panel A and B indicate that trade sales are a usual exit channel in private equity. The older general partners are, the more capital they have invested in the preparation of portfolio companies that lead to a sale to a strategic acquirer.

Panel C shows that US-based general partners are more active in trade sales than buyout firms located outside the US. We see that they had conducted on median one more trade sale at the time of the trade sale observed in our sample. Correspondingly, they had also invested more capital in portfolio companies that were exited by trade sale.

The unit of analysis of our investigation in this paper is a buyout-backed trade sale. Therefore, in Table 2-11 we present descriptive sample statistics at the deal level. We analyze 656 trade sales between 1980 and 2013. The median exit year is 2006. On median the buyout firms owned a portfolio company 4.3 years before the trade sale. They invested USD 20.3 million and generated a PME of 1.9. A PME of 1.9 implies that the median trade sale outperformed a contemporaneous investment in public markets[73].

Panel A illustrates the geographical spread of our sample. Of the portfolio companies that were sold, 46% (304) were based in North America, 51% (332) were located in Europe and 3% (20) in Asia. A lot of private equity research is limited to the US market (Braun et al., 2017). The internationality of our sample overcomes this limitation and allows us a comprehensive analysis of trade sales.

Panel B allocates our trade sales to the corresponding industries in which the respective portfolio companies operate[74]. We can see that the highest PMEs are generated with trade sales in manufacturing or in the category "Others". However, all industry groups outperformed public markets (PME > 1.0) on median average.

The last panel categorizes our trade sales according to time periods. The moderate increase of the median PME from 1.8 for the time 1980-2003 to 2.1 for 2008-2013 came along with a more drastic increase of median holding periods of portfolio companies and amounts invested in them (a holding period of from 3.5 to 4.8 years, with total invested capital from USD 8.1 to 41.5 million).

[73] A PME of 1 implies that the trade sale return is equal to the return of the benchmark index. A value < 1 implies that the trade sale return underperforms that of the benchmark index; a value > 1 implies an outperformance.

[74] The trade sales are allocated to the four industry groups according to the SIC codes of the respective portfolio companies. The "Manufacturing" group corresponds to the SIC divisions (including all underlying SIC codes) 2000, 3000, 4000, the "Trade" group to 5000, the "Services" group to 7000, 8000 and the "Others" group to all the rest. The SIC division structure is provided online by the United States Department of Labor (2017).

Table 2-11: Descriptive sample statistics at the deal level – Buyout trade sales

Table 2-11 illustrates our sample at the investment level. We analyze 656 trade sales of buyout capital backed portfolio companies (BO trade sales). The table is structured in five panels and shows median values of exit year, holding period in years, total capital invested in millions of USD and PMEs. The PME values are calculated in comparison to regional MSCI indices. The first row shows the whole sample of 656 BO trade sales. In Panels A and B the trade sales are allocated according to the region and industry group of the portfolio company in the respective trade sale. Panel C allocates the trade sales to different time periods, measured by exit year.

			Median			
	Obs. #	Obs. %*	Exit year	Holding period [yrs]	Total capital invested [m USD]	PME
All trade sales	656	100%	2006	4.3	20.3	1.9
Panel A: Region						
North America	304	46%	2004	4.5	20.2	2.1
Europe	332	51%	2006	4.0	20.1	1.8
Asia	20	3%	2006	2.7	30.6	2.2
Panel B: Industry groups						
Manufacturing	230	35%	2006	4.3	18.9	2.1
Trade	108	16%	2006	4.5	18.3	1.6
Services	191	29%	2005	4.0	14.9	1.8
Others	127	19%	2006	3.9	36.5	2.1
Panel C: Time categories						
1980-2003	218	33%	1999	3.5	8.1	1.8
2004-2007	267	41%	2006	4.5	24.4	2.0
2008-2013	171	26%	2010	4.8	41.5	2.1

* Percentage values may not add up to 100% due to rounding

2.4.3. Description of variables

PME

Since we investigate the return effects of industry relatedness in trade sales our dependent variable is a performance measure of private equity investments. We choose the PME because it allows for a direct benchmark to public markets and thereby a certain kind of risk adjustment (Sorensen and Jagannathan, 2015). Further, it is more robust to manipulation than other traditional performance measures (Sorensen and Jagannathan, 2015). As a result, the PME is used increasingly in recent private equity research (e.g., Kaplan and Schoar, 2005;

Harris et al., 2014; Braun et al., 2017). We calculate PMEs according to the definition of Kaplan and Schoar (2005) with the following formula:

$$PME = \frac{\sum_t \frac{dist(t)}{1+r_M(t)}}{\sum_t \frac{call\ (t)}{1+\ r_M(t)}} \quad (3)^{75}$$

For our use, we take the cash flows between the general partners and their portfolio companies (before any deductions for carried interest and management fees) and discount them by regional MSCI total return indices (r_M). We define cash contribution (call)[76] as the capital that the general partner invests in a portfolio company. It includes the one-off purchase at the beginning and all necessary investments over the course of the holding period. Cash distribution (dist) is the cash the general partner received from dividends and/or the sale of the portfolio company.

We winsorize PMEs at the investment level at the 99th percentile. Since the distribution of PME-values in our sample is right-skewed, we use the natural logarithm transformation of this variable (*PME* (ln)) in our multivariate analyses.

We do not include analyses of the traditional performance measures, internal rate of return (IRR) and investment multiple (IM), in the main part of our paper. However, we provide results using them as dependent variables in Section 2.8. (appendix).

The reason we choose the PME as performance measure is based on the disadvantages of the IRR and IM: neither measure considers risk or opportunity costs. In addition, the IRR is prone to timing and not suitable for comparing investments with different investment durations (Sorensen and Jagannathan, 2015).

[75] Formula is based on Sorensen and Jagannathan (2015).
[76] Call = Capital call (Sorensen and Jagannathan (2015).

Trade sale type

We use two specifications of trade sale types. First, the dummy variable trade sale class (*TS Class*) that differentiates between the broader classifications of lateral versus synergetic trade sales (lateral = 0; synergetic = 1). Second, three identifier variables that differentiate between horizontal (*TS Class – Horizontal* equals 1 if trade sale is horizontal), vertical (*TS Class – Vertical* equals 1 if trade sale is vertical) and lateral[77] trade sales. The allocation of the trade sales to the specific transaction types follows the approach described in section 3.2. Due to the lack of IO-industry codes available in databases our primary industry classifications of the acquiring and the portfolio companies are the Standard Industry Classification (SIC) codes[78], collected from the Capital-IQ, ThomsonOne and Pitchbook databases. We match the SIC codes to the companies in our sample: for each transaction between general partner (seller) and buyer (acquiring firm) we observe two industries, the one of the portfolio company and the one of the buyer. In the next step we check the compatibility of that information with the 1987 SIC manual[79] and the 1992 SIC-IO bridge reported by the Bureau of Economic Analysis[80]. For most four-digit SIC codes there is one corresponding IO code available. However, sometimes there is just one IO code for a group of four-digit SIC codes. While, for example, the SIC code 2047 (Dog and Cat Food) is assigned to exactly one IO code (141501), the IO code 290100 is valid for the SIC industry group 283 (Drugs), which includes four unique four-digit SIC codes. Therefore, we alter the collected SIC code information for some companies to guarantee the match with IO codes. For example, a company with the four-digit SIC code 2834 (Pharmaceutical Preparations) gets the SIC code 283. This approach allows for an appropriate conversion of SIC codes to IO codes. After the collection of IO codes for all acquiring and portfolio companies, we are able to match the corresponding vertical industry relatedness coefficients to each pair of companies. For this purpose, we use inter-industry vertical relatedness coefficients based on the approach described in 3.2 and provided by Fan

[77] Lateral dummy is omitted in the regressions.
[78] While there is a variety of industry classification systems, the SIC is often applied in research (e.g., Kahle and Walkling (1996); Fan and Goyal, 2006; Shenoy, 2012; Achleitner et al., 2014).
[79] Provided online by the United States Department of Labor (2017).
[80] Data provided online by the Bureau of Economic Analysis (2017) in a download bundle called "*1992 Benchmark I-O SIC-Based Table Six-Digit Transactions"*. The file of interest is "*Sic-IO*".

and Lang (2000). Subsequently we classify the trade sales in our sample according to the scheme in Figure 2-2 (also described in section 3.2).

Further explanatory variables

We also include further explanatory variables that tend to influence the returns of trade sales. At the deal level we control for different investment durations of general partners in the respective portfolio companies before the exit. We name this variable *Holding period*. It is measured in years (with decimal places).

Next, we include *GP Age*, *GP Invested Capital until Exit* and *GP Not US-based* as explanatory variables on the general partner level. *GP Age* is our proxy for the experience of a buyout manager. It is calculated by subtracting the year of the trade sale from the founding year of the general partner and then adding one. We use the natural logarithm for this variable, because learning curve effects decrease with time. *GP Invested Capital until Exit* is our proxy for general partners' firm size. It is the total capital amount in millions of USD that a buyout firm has invested in trade sales before a particular exit is conducted. Since we want to correct for some outliers in size (right-skewed distribution), we narrow the range of the variable taking the natural logarithm of it. The last explanatory variable at the general partner level is a regional dummy (*GP Not US-based*). It equals one if the headquarters of the respective general partner is located outside the US[81].

Last, we control for market conditions in private equity and public markets. Our *PE Competition* measures raised buyout capital by a rolling calculation over four years and normalizes this amount with a GDP figure (Braun et al., 2017). The normalization is conducted by North American, European or Asian GDP figures, depending on the country in which the portfolio company is located in the respective trade sale[82]. *PE Competition* is a proxy for investment pressure in private equity markets. During times of increasing buyout competition general partners would have no incentive to sell a portfolio company without getting a really high price for it, because they have enough dry powder that they are expected

[81] We differentiate only binary, because we have a minor share of general partners that are located outside Europe or the US in our sample.

[82] Due to data constraints, the variable is only calculated for the years 1980-2011.

to invest. Therefore it is likely that buyout competition influences investment returns. Besides private equity market conditions we also control for public market conditions. We identify recession and boom years and create two specific dummy variables: *Boom Indicator* and *Crisis Indicator*. Both variables are based on the average yearly change of the MSCI world performance index. The *Boom Indicator* equals one if the yearly change in average growth was bigger than +20%, the *Crisis Indicator* equals one if this change was lower than +5%. The *Boom Indicator* identifies the years: 1983, 1985-1987, 1999, 2004 and 2010. The *Crisis Indicator* identifies the years: 1982, 2001, 2002, 2008 and 2009. The reference year for both public market condition dummies is a normal year that does not indicate a boom or crisis.

2.5. Empirical results

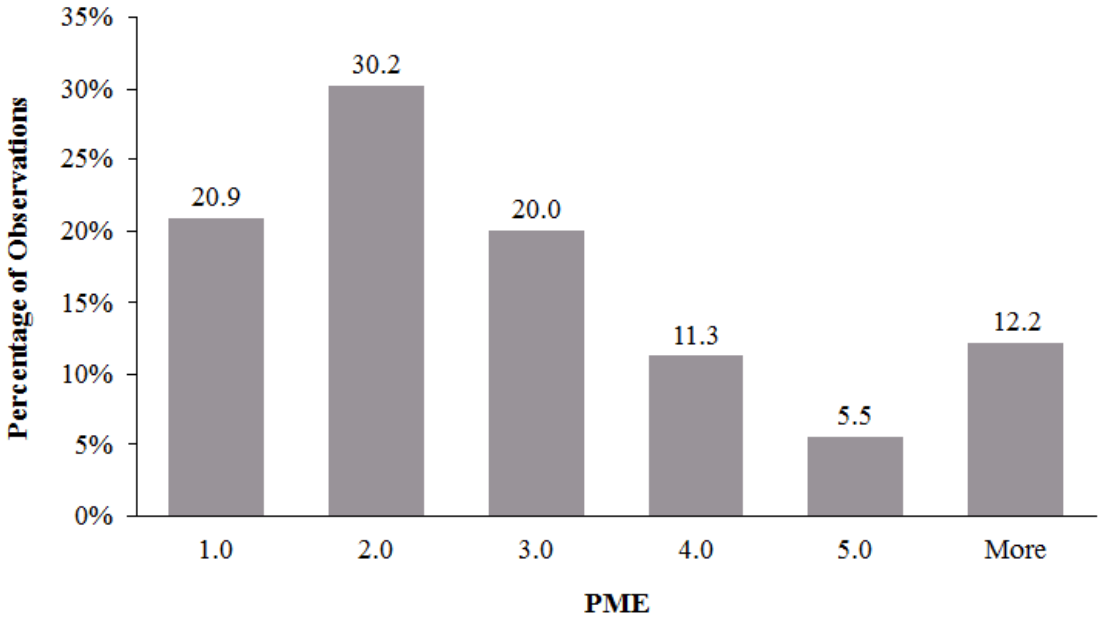
2.5.1. Descriptive statistics

Table 2-12 reports descriptive statistics about the performance of our sample of 656 trade sales. The median PME a trade sale generated is 1.9 (Panel A). The standard deviation and the illustration in Figure 2-3 show that the PME dispersion in our sample is widely spread. The average performance of a trade sale in our sample is generally consistent with other recent studies that show a relatively high performance of trade sales as well (Lopez-de-Silanes et al., 2015; Degeorge et al., 2016). Comparing the median PME of 1.9 in our sample with the median PME of 1.7 in the sample investigated by Lopez-de-Silanes et al. (2015)[83], our exits seem to perform better at first sight. Since Lopez-de-Silanes et al. (2015) investigate investments until 2005 and our sample incorporates more than 50% of trade sales conducted after 2005 (332 trade sales), the deviation can stem from this difference in the observation period. This is especially likely, because Table 2-11 shows that the average performances of trade sales increase by time and the median PME of a trade sale within our time category 1980-2003 is 1.8.

[83] Lopez-de-Silanes et al. (2015) analyze 1350 trade sales with a median PME of 1.7.

Figure 2-3: PME histogram

Figure 2-3 presents the percentage distribution of PME values of our 656 trade sales. Each bar includes all observations of the displayed value and below[84].



Panels B to D split our sample according to trade sale types and moderation effects. We compute two-sided t-tests and two-sided Wilcoxon rank-sum tests (Wilcoxon, 1945; Mann and Whitney, 1947) to analyze the statistical significance of differences in PME means and medians. According to the PME medians displayed in Panel B, lateral trade sales perform better than synergetic deals: the difference is significant at the 5% significance level. If we specify the categorization of synergetic trade sales in horizontal and vertical, the median PME in Panel C implies that the performance difference between lateral and synergetic trade sales could be driven by horizontal exits (z-test significant at the 1% significance level).

[84] Thresholds are based on the ones in the illustration of Lopez-de-Silanes et al. (2015).

Table 2-12: PME returns on trade sale level

This table shows descriptives of the PME performance of the 656 buyout-backed trade sales in our sample. The deal-level PMEs are calculated in comparison to regional MSCI indices. The table is structured in four panels: Panel A displays values for the full sample. Based on the industry relatedness between portfolio company and acquirer we split the sample according to trade sale type categories in Panels B and C. We distinguish between the broader differentiation lateral versus synergetic trade sales (Panel B) and the more detailed categorization lateral, horizontal and vertical (Panel C). Panel D presents our sample separated by trade sale type and our three moderation effects: holding period (D.1), general partner experience (D.2) and public market conditions (D.3). The trade sales in D.1 and D.2 are split according to the median holding period of 51 months and the median general partner age of 21 years (age as a proxy for experience), respectively. In Panel D.3 trade sales are allocated to "low MSCI growth" when the global MSCI change was <= 14% (median value) and to "high MSCI growth" when the change was above this threshold. To compare the means of the subsamples we run two-group mean comparison tests (two-sided t-tests). To test for differences in medians we compute two-sided Wilcoxon rank-sum tests (Wilcoxon, 1945; Mann and Whitney, 1947). T-values for means and z-values for medians are listed together in the same rows. *, ** and *** indicate significance at 10%, 5% and 1% level, respectively.

	Obs. #	Mean	25%	Median	75%	SD
PME						
Panel A: All trade sales	656	2.94	1.16	1.94	3.27	4.70
Panel B: Trade sale type (2 cat.)						
Lateral trade sales	341	2.97	1.28	2.01	3.44	3.55
Synergetic trade sales	315	2.91	1.01	1.82	3.12	5.69
T-test/Z-test		0.17		2.19**		
Panel C: Trade sale type (3 cat.)						
Lateral trade sales	341	2.97	1.28	2.01	3.44	3.55
Horizontal trade sales	189	2.64	0.92	1.71	2.94	4.88
Vertical trade sales	126	3.30	1.15	2.13	3.47	6.73
T-test/Z-test (lateral vs. horizontal)		0.81		2.84***		
T-test/Z-test (lateral vs. vertical)		-0.53		0.39		

	Lateral			Synergetic		
	Obs. #	Mean	Median	Obs. #	Mean	Median
Panel D: Trade sales by type and holding period, GP firm experience and market conditions						
D.1: Holding period						
Short investment duration	162	3.10	2.20	167	3.40	1.85
Long investment duration	179	2.85	1.86	148	2.35	1.73
T-test/Z-test		0.67	2.69***		1.72*	1.25
D.2: GP firm experience						
Less experience	185	3.56	2.38	159	3.58	2.05
More experience	156	2.27	1.72	156	2.22	1.67
T-test/Z-test		3.60***	3.46***		2.15**	1.70*
D.1: Market conditions						
Low MSCI growth	171	3.35	2.30	158	3.05	2.02
High MSCI growth	170	2.58	1.89	157	2.76	1.67
T-test/Z-test		2.00**	2.39**		0.46	0.99

Panel D categorizes our sample according to lateral and synergetic as well as to the three moderation effects: holding period, general partner experience and public market conditions.

We can observe that there are indeed performance differences under the categorization by moderator effects. According to different investment durations, Panel D.1 shows that trade sales with long holding periods preceding the exit generate lower PMEs. The differences are significant in median PMEs for lateral sales (at the 1% significance level) and in mean PMEs for synergetic trade sales (at the 10% significance level). Panel D.2 indicates that the experience of general partners has a relevant effect on performance differences as well. First, we see that less experience comes along with higher PMEs and second, that the performance difference is stronger in the case of lateral trade sales. PME differences for both types of trade sales are significant in mean and median values (lateral at 1% and synergetic at 5% to 10% significance levels). Concerning the moderating effect of public market conditions we observe that trade sales outperform public markets more strongly if the market growth is small (Panel D.3). Here, the use of the PME shows its advantage, because it delivers a performance indication in comparison to market returns and is not limited to an absolute performance measurement that would tend to show higher returns in boom periods (as in Achleitner et al., 2012; Achleitner et al., 2014). However, differences in mean and median PMEs are only significant for lateral trade sales (at 5% significance levels).

2.5.2. Multivariate results

In this section, we present multivariate cross-sectional OLS regressions to test our hypotheses. The unit of analysis is a private equity trade sale (exit). We include various control variables on the deal-, general partner- and market-level. Furthermore, we incorporate year-, industry- and region-fixed effects to control for time-dependent external effects and different macroeconomic and risk environments at the portfolio company level (like e.g., Lopez-de-Silanes et al., 2015). To ensure heteroscedasticity-consistent standard errors, we estimate standard errors using Huber-White sandwich estimators (Huber, 1967).

2.5.2.1. Return differences between lateral and synergetic relatedness in buyout trade sales

Table 2-13 shows several regressions testing the effects of industry relatedness and other factors on the performance of trade sales. We differentiate between lateral and synergetic industry relatedness. The dependent variable is the *PME* (ln)[85]. We present 11 Models. Model 1 is our basis model, which analyses the return differences of industry relatedness in buyout-backed trade sales. It includes 609 buyout trade sales. Due to the incorporation of the *PE Competition* variable, which is not available for all trade sales, the sample size is reduced from 656 to 609. Table 2-16 (Section 2.8. [appendix]) shows the same regressions without the *PE Competition* variable[86]. In Models 2 to 10 our sample is split into subsamples according to the three levels of moderating factors: on the deal level, the holding period of a portfolio company, on the general partner level, the experience of the buyout firm and on the market level, the public market conditions at the time of the trade sale. For each level of moderator, we show three models: two for the split into two subsamples and one including the interaction effects. Model 11 includes all interaction terms.

Model 1 shows a significant negative effect of the *TS Class* Dummy on *PME* (ln) at the 5% significance level, meaning that synergetic trade sales end up with significant lower returns for general partners. Model 1 estimates that the PME of trade sales to synergetic buyers is -26.3%[87] lower than trade sales to lateral buyers. This result supports Hypothesis 1, that investment returns are different if the portfolio company is sold to a lateral rather than to a synergetic buyer. Analyses with other performance measures (IM and IRR) support this result as well (see Tables 2-17 and 2-18 in Section 2.8. [appendix]).

[85] We run the same regressions as in Table 2-13 with investment multiples (IM) and IRRs as dependent variables. The main effects are the same. See Tables 2-17 and 2-18 in Section 2.8. (appendix).
[86] The results are the same.
[87] -26.3% = 100 * (EXP(-0.305)-1) (Wooldridge (2009).

Table 2-13: OLS regressions on PME – lateral vs. synergetic trade sales

Table 2-13 shows OLS regressions, estimating the effects of trade sale type (lateral vs. synergetic) and other control variables on the PME returns of buyout trade sales. All models estimate standard errors using Huber-White sandwich estimators (Huber, 1967) and incorporate year-, industry- and region-fixed effects. Time-fixed effects correspond to respective exit years. PME values are winsorized at the 99th percentile and are calculated in comparison to regional MSCI indices. *, ** and *** indicate significance at 10%, 5% and 1% level, respectively. The corresponding t-statistics are provided in parentheses.

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
Dependent variable: PME (ln)	**All**	**Short inv. duration**	**Long inv. duration**	**Interaction inv. duration**	**Less exp.**	**More exp.**	**Interaction experience**	**Low MSCI growth**	**High MSCI growth**	**Interaction MSCI growth**	**Interaction All**
TS Class (later vs. synergetic)	-0.305**	-0.459**	-0.177	-0.431**	-0.404**	-0.312	-0.415**	-0.579**	-0.122	-0.615**	-0.806**
	(-2.247)	(-2.121)	(-0.936)	(-2.104)	(-2.130)	(-1.534)	(-2.298)	(-2.189)	(-1.014)	(-2.410)	(-2.476)
Holding Period (Years)	-0.028				0.020	-0.070**	-0.030	0.003	-0.054**	-0.023	
	(-1.106)				(0.503)	(-2.311)	(-1.210)	(0.062)	(-2.592)	(-0.922)	
GP Age (ln)	-0.230**	-0.095	-0.413**	-0.233**				-0.506**	0.044	-0.257**	
	(-2.130)	(-0.656)	(-2.294)	(-2.197)				(-2.567)	(0.382)	(-2.313)	
GP Inv. Capital until Exit (ln)	-0.032	-0.037	0.014	-0.032	0.026	-0.097*	-0.034	-0.029	-0.036	-0.023	-0.025
	(-0.885)	(-0.647)	(0.248)	(-0.886)	(0.509)	(-1.797)	(-0.914)	(-0.461)	(-0.846)	(-0.644)	(-0.665)
GP Not US-based (Dummy)	0.193	0.628	-0.084	0.182	-0.142	0.175	0.228	0.176	0.148	0.195	0.219
	(0.608)	(1.300)	(-0.224)	(0.577)	(-0.353)	(0.416)	(0.721)	(0.401)	(0.421)	(0.616)	(0.696)
PE Competition	-20.666	45.433	-76.585	-21.031	-79.470	-22.192	-20.123	-12.410	-29.103	-17.465	-18.257
	(-0.346)	(0.558)	(-1.250)	(-0.353)	(-1.151)	(-0.347)	-0.340	(-0.175)	(-0.500)	(-0.293)	(-0.309)
Public Marekt Control Dummies (Reference normal Year)											
Boom Indicator (Dummy)	0.225	0.422	0.242	0.228	0.570	1.002***	0.294				
	(0.657)	(0.709)	(0.556)	(0.675)	(1.033)	(2.650)	(0.834)				
Crisis Indicator (Dummy)	0.039	-0.439	0.428	-0.018	0.648	0.628	0.075				
	(0.093)	(-0.928)	(0.845)	-0.043	(0.977)	(1.442)	(0.177)				
Holding period group (Dummy)				-0.305**							-0.287**
				(-2.105)							(-2.004)
TS Class X *Holding Period Group*				0.272							0.244
				(1.083)							(0.980)
GP Exp. group (Dummy)							-0.350**				-0.359***
							(-2.531)				(-2.599)
TS Class X *GP Exp. Group*							0.215				0.158
							(0.905)				(0.665)
MSCI Change Cat. (Dummy)										0.138	0.207
										(0.407)	(0.586)
TS Class X *MSCI Change Cat.*										0.586**	0.579**
										(2.039)	(2.046)
Year-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	1.619***	1.243*	1.777***	1.688***	0.437	0.792**	1.025***	2.070***	1.185**	1.619***	1.007***
	(4.825)	(1.947)	(3.805)	(5.081)	(1.151)	(2.439)	(3.876)	(3.558)	(2.018)	(4.862)	(4.942)
Observations	609	317	292	609	320	289	609	284	325	609	609
R2	0.136	0.189	0.114	0.139	0.195	0.186	0.137	0.201	0.083	0.144	0.148

Models 2 to 4 analyze return differences of industry relatedness under the moderating effect of investment duration. We split our sample of trade sales into those of portfolio companies which have been hold rather short (Model 2) and rather long (Model 3). The newly created dummy variable is named *Holding period group* and the cut used between the subsamples is the median holding period of 51 months[88]. Model 4 includes the potential interaction effect of the trade sale class and the investment duration. We do not find a significant interaction effect. Therefore, we cannot fully support our Hypothesis 3. However, we can interpret the differences between Models 2 and 3 and infer some insights about return differences of industry relatedness in the context of different holding periods. The significant impact (at the 5% significance level) of industry relatedness (*TS Class*) remains only for the group of portfolio companies which are held for a rather short time by the buyout firm. This supports the argument that lateral buyers follow market entry and information access objectives, which could be reached even after short holding periods. The absence of significance of our *TS Class* dummy in Model 3 (long investment duration) could be interpreted as weak support for an assimilation in the respective willingness to pay between lateral and synergetic buyers after longer holding periods, because this time lowers the information asymmetry disadvantage of lateral buyers. In sum, we take these arguments as weak support for Hypothesis 3.

Models 5 to 6 investigate the potential moderating effect of general partners' experience on return differences of industry relatedness in buyout trade sales. Again, we show two models (Models 5 and 6) with subsamples of trade sales where the selling general partners had less or more experience at the time of the exit. We use the age of general partners as a proxy for experience (Kaplan and Schoar, 2005; Achleitner et al., 2014). Less experience is defined as smaller than or equal to the median of 21 years, and more experience as bigger than the median[89] (Dummy variable = *GP Exp. group*). Model 7 contains the interaction term between *TS Class* and *GP Experience group.* The interaction effect is not significant. Therefore, we cannot accept Hypothesis 4 implicitly. But again, we can interpret the different results of the subsample regressions (Models 5 and 6). The negative return effect of synergetic

[88] The median is calculated on the basis of 656 buyout-backed trade sales. Since Table 2-13 analyzes only 609 trade sales the subsamples are not equally sized.
[89] The median is calculated on the basis of 656 buyout-backed trade sales. Since Table 2-13 analyzes only 609 trade sales the subsamples are not equally sized.

trade sales only holds true in the subsample of less experienced general partners (Model 5 at the 5% significance level). We interpret this as weak support for Hypothesis 4. The industry relatedness only has a significant effect on the trade sale return when the experience of the selling general partner is low. More experienced general partners use their reputations and networks to reduce information asymmetry during the selling process (Achleitner et al., 2014). In Model 1 we see evidence that lateral buyers pay relatively more in trade sales. Because lateral buyers suffer more under information asymmetry, those buyers gain when these information gaps are closed by experienced fund managers. Consequently, we interpret the absence of a significant return impact of industry relatedness in Model 6 as weak proof of an assimilation of prices between lateral and synergetic buyers when the experience of the selling general partner is high.

Models 8 to 10 investigate public market conditions as a potential moderating factor of the return differences of industry relatedness in trade sales. We use the change of the global MSCI index as proxy for changes in public market conditions. The subsample in Model 8 incorporates all trade sales in years when the global MSCI change was less than or equal to 14%. Model 9 contains all trade sales in which this change was above 14%[90] [91]. The newly created dummy variable is named *MSCI Change Category*. The interaction term in Model 10 *TS Class* X *MSCI Change Category* is positive at 5% significance. We further find that the *TS Class* coefficient is only significant negative in Model 8 (at the 5% significance level), and not significant in Model 9. Consequently, the return difference between lateral and synergetic trade sales is proven in times when public market conditions are less favorable. We interpret these results as strong support for Hypothesis 5. Less favorable public market conditions at the time of the trade sale influence the buyout firms' return differences between lateral and synergetic trade sales.

[90] Rounded value: The median of the years 1980-2013 is 13,91 %. This value is calculated on the basis of all buyout trade sales. Years with many trade sales are considered multiple.
[91] The median is calculated on the basis of 656 buyout backed trade sales. Since Table 2-13 analyzes only 609 trade sales the subsamples are not equally sized.

2.5.2.2. Peculiarities within synergetic trade sales – Vertical versus horizontal relatedness

In our next step we shed light on the peculiarities of different synergetic trade sales. In the previous section we confirmed Hypothesis 1, that investment returns differ between lateral and synergetic trade sales. In fact, they are higher if the portfolio company is sold to a lateral buyer. Since there are differences in strategic acquisition rationales within the group of synergetic buyers, we want to differentiate further between vertical and horizontal buyers. Table 2-14 present regressions with the same logic and specifications as in Table 2-13, except for the difference that we now incorporate two trade sale class dummy variables, *TS Class – Horizontal* and *TS Class – Vertical*. The omitted category (base group) includes lateral trade sales.

Model 1 shows a significant negative effect of horizontal trade sales compared to lateral trade sales (at the 5% significance level). The model estimates that this effect is -30.7%[92]. The coefficient of the vertical trade sale dummy is insignificant and less negative. It seems that only sales to horizontal buyers lead to lower returns. This would support Hypothesis 2, which states that comparing returns of horizontal and vertical trade sales with lateral ones, the return differences are stronger in horizontal deals. However, including all potential interaction effects, Model 11 reports significant negative return impacts of horizontal and vertical trade sales (to the 10% significance level). Now, the coefficient of the vertical dummy is more negative. We interpret these contradicting results as a rejection of Hypothesis 2. However, the findings support Hypothesis 1 even more.

Models 2 to 11 of Table 2-14 offer the opportunity to gain more insights about the moderating factors of return differences in trade sales. Concerning the potential influencing effect of investment duration we observe similar results for horizontal and for synergetic trade sales (Models 2 to 4). Model 2 shows a significant return difference between horizontal and lateral trade sales when holding periods are short. Since we do not observe any significance for the vertical versus lateral comparison, we conclude that the difference stems from horizontal specific acquisition rationales.

[92] -30.7% = 100 * (EXP(-0.367)-1) (Wooldridge (2009).

Table 2-14: OLS regressions on PME – horizontal vs. vertical trade sales

This table presents OLS regressions, estimating the effects of horizontal and vertical trade sales (in comparison with lateral deals) and other explanatory variables on the PME returns of buyout trade sales. All models estimate standard errors using Huber-White sandwich estimators (Huber, 1967) and incorporate year-, industry- and region-fixed effects. Time-fixed effects correspond to respective exit years. PME values are winsorized at the 99th percentile and are calculated in comparison to regional MSCI indices. *, ** and *** indicate significance at 10%, 5% and 1% level, respectively. The corresponding t-statistics are provided in parentheses.

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
Dependent variable: PME (ln)	**All**	**Short inv. duration**	**Long inv. duration**	**Interaction inv. duration**	**Less exp.**	**More exp.**	**Interaction experience**	**Low MSCI growth**	**High MSCI growth**	**Interaction MSCI growth**	**Interaction All**
TS Class - Horizontal (Dummy)	-0.367**	-0.512**	-0.256	-0.482**	-0.411*	-0.490**	-0.351	-0.605*	-0.181	-0.640**	-0.721*
	(-2.282)	(-2.022)	(-1.202)	(-1.976)	(-1.754)	(-2.040)	(-1.616)	(-1.949)	(-1.383)	(-2.151)	(-1.930)
TS Class - Vertical (Dummy)	-0.201	-0.367	-0.045	-0.346	-0.391	-0.037	-0.505*	-0.527	-0.031	-0.560	-0.884*
	(-1.142)	(-1.239)	(-0.194)	(-1.247)	(-1.295)	(-0.177)	(-1.736)	(-1.499)	(-0.178)	(-1.617)	(-1.775)
Holding Period (Years)	-0.027				0.020	-0.070**	-0.031	0.003	-0.053**	-0.023	
	(-1.097)				(0.513)	(-2.358)	(-1.265)	(0.064)	(-2.548)	(-0.896)	
GP Age (ln)	-0.233**	-0.094	-0.430**	-0.238**				-0.507**	0.039	-0.260**	
	(-2.170)	(-0.648)	(-2.366)	(-2.237)				(-2.570)	(0.348)	(-2.349)	
GP Inv. Capital until Exit (ln)	-0.030	-0.034	0.017	-0.030	0.027	-0.098*	-0.034	-0.028	-0.034	-0.022	-0.026
	(-0.834)	(-0.609)	(0.300)	(-0.833)	(0.505)	(-1.842)	(-0.907)	(-0.447)	(-0.822)	(-0.605)	(-0.676)
GP Not US-based (Dummy)	0.193	0.628	-0.085	0.183	-0.141	0.131	0.207	0.185	0.140	0.191	0.195
	(0.609)	(1.299)	(-0.224)	(0.581)	(-0.348)	(0.308)	(0.653)	(0.415)	(0.391)	(0.596)	(0.617)
PE Competition	-21.696	45.257	-78.550	-22.028	-79.511	-31.154	-24.482	-13.196	-29.562	-18.185	-22.413
	(-0.365)	(0.556)	(-1.269)	(-0.371)	(-1.152)	(-0.501)	(-0.421)	(-0.187)	(-0.503)	(-0.306)	(-0.387)
Public Marekt Control Dummies (Reference normal Year)											
Boom Indicator (Dummy)	0.227	0.492	0.251	0.230	0.570	0.987***	0.318				
	(0.666)	(0.791)	(0.575)	(0.681)	(1.031)	(2.634)	(0.905)				
Crisis Indicator (Dummy)	0.075	-0.404	0.453	0.013	0.649	0.741*	0.165				
	(0.179)	(-0.857)	(0.888)	(0.032)	(0.983)	(1.694)	(0.397)				
Holding period group (Dummy)				-0.305**							-0.285**
				(-2.100)							(-1.988)
TS Class - Horizontal X holding period group				0.247							0.254
				(0.828)							(0.847)
TS Class - Vertical X holding period group				0.318							0.185
				(0.924)							(0.557)
GP Exp. group (Dummy)							-0.344**				-0.353**
							(-2.470)				(-2.538)
TS Class - Horizontal X GP Exp. group							-0.035				-0.076
							(-0.112)				(-0.243)
TS Class - Vertical X GP Exp. group							0.577*				0.510*
							(1.700)				(1.685)

Table 2-14: OLS regressions on PME – horizontal vs. vertical trade sales (continued)

MSCI Change Cat. (Dummy)										0.140	0.238
										(0.413)	(0.686)
TS Class - Horizontal X *MSCI Change Cat.*										0.532	0.530
										(1.629)	(1.632)
TS Class - Vertical X *MSCI Change Cat.*										0.647	0.595
										(1.624)	(1.553)
Year-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	1.619***	1.224*	1.814***	1.693***	0.434	0.899***	1.041***	2.069***	1.260**	1.618***	1.013***
	(4.848)	(1.910)	(3.856)	(5.084)	(1.144)	(2.735)	(3.976)	(3.560)	(2.167)	(4.868)	(4.930)
Observations	609	317	292	609	320	289	609	284	325	609	609
R2	0.137	0.190	0.117	0.140	0.195	0.198	0.143	0.201	0.086	0.146	0.153

We find clarifying results for the moderating effect of general partners' experience on return differences in trade sales as well. The analyses of subsamples in Models 5 and 6 show that horizontal buyers pay less than lateral buyers no matter whether the fund manager's experience is low or high (coefficients are economically similar). Moreover, we also find interesting insights in the comparison of vertical to lateral buyers. Model 7 reports significant positive *TS Class – Vertical* X *GP Experience* interactions (at the 10% significance level) and a significant negative effect of the vertical trade sale dummy (at the 10% significance level). The coefficients of the *TS Class – Vertical* dummy in our subsamples (Models 5 and 6) are insignificant. However, they differ in amplitude. For trade sales of less experienced fund managers it is estimated that vertical buyers pay -32.4%[93] less than lateral buyers. In the case of more experienced sellers this difference is only -3.6%[94]. Therefore, we find weak evidence for the moderating effect of general partner experience on trade sale return differences between vertical and lateral buyers. We conclude that the significant return difference in the case of less experienced sellers for synergetic buyers is driven by vertical buyers and less by horizontal buyers.

Models 8 to 10 suggest that public market conditions have an influence on the return differences between horizontal and lateral trade sales. The *TS Class – Horizontal* dummy is negative when MSCI growth is low (at the 10% significance level). Although the positive interaction term (*TS Class – Horizontal* X *MSCI Change Cat.*) is insignificant, the t-value is rather high (t-value = 1.629). In addition to this, the *TS Class – Horizontal* dummy is significantly negative in Model 10 (to the 5% significance level). Together, the results lead us to the interpretation that the public market conditions affect the return differences between lateral and horizontal trade sales. Since the coefficients of the *TS Class –*
Vertical dummy are insignificant for all three models (Models 8 to 10), we conclude that there is no moderating effect of public market conditions on differences between vertical and lateral trade sales.

[93] -32.4% = 100 * (EXP(-0.391)-1) (Wooldridge (2009).
[94] -32.4% = 100 * (EXP(-0.037)-1) (Wooldridge (2009).

In summary, we find weak support for the argument that the influence of investment duration and public market conditions on return differences between lateral and synergetic trade sales stems from horizontal rather than from vertical trade sales. Further, we find some evidence that the significant return difference in the case of less experienced sellers is driven more by vertical buyers and less by horizontal buyers. Finally we do not find conclusive evidence that either horizontal or vertical relatedness drives the return difference between synergetic and lateral trade sales in general (Models 1 and 11).

2.6. Discussion

2.6.1. General discussion

In this paper, we find evidence that buyout managers generate higher returns in trade sales if they sell to lateral rather than to synergetic buyers. Consequently, less industry relatedness between the portfolio company and the buyer is favorable for the returns of selling general partners. We interpret this finding as support for the argumentation that strategic objectives like market entry and information access, typical for lateral buyers, lead to a higher willingness to pay. Further, our results suggest that strategic acquisition objectives of synergetic buyers, like market power and efficiency gains, do not lead to higher prices compared to lateral offers. The efficiency gain argument does not fully account for the case of former buyout firm owned portfolio companies, because they have often already been optimized by the fund managers.

We further find that short investment durations of general partners in the respective portfolio companies increase the return difference between lateral and synergetic buyers, especially when we compare horizontal with lateral acquirers. We interpret this as further evidence for the importance of strategic acquisition objectives for lateral buyers, which are given even after short private equity investment durations. Concerning the effect of general partner

experience, we find that the return difference between lateral and synergetic (especially vertical) trade sales is distinctive when the selling fund manager is less experienced. This finding suggests that more experience on the part of general partners leads to a better information base about the target for lateral buyers, who usually suffer from more information asymmetry. The improvement of information availability can stem from better reputation and networks (Achleitner et al., 2014) or a higher level of professionalism and could explain the similarity of the returns of lateral and synergetic trade sales when general partner experience is high. This argumentation also holds true for the case of long investment durations, which also contribute to the publicity and the available information base of the company to be sold, hence illustrating a reason for the similarity in the bidding prices of different related buyer groups. Last, we find evidence for an influence of public market conditions on return differences of industry relatedness in buyout-backed trade sales. Our results show that during times of high public market growth trade sales returns are not significantly different between lateral and synergetic buyers (especially horizontal). This similarity could be based on increased deal competition during boom periods that leads to high bidding prices from all types of buyers. Less favorable market conditions, in contrast, reveal the return differences of industry relatedness in trade sales, because different strategic acquisition objectives and levels of available information matter during normal times.

2.6.2. Comparison between BO and VC

Since our motivation for this paper is based on the investigation of industry relatedness in venture capital trade sales (Achleitner et al., 2014), we want to compare our results for buyout with venture capital trade sales as well. For this purpose, we collected new data about 281 venture capital trade sales. We apply the same sample adjustment procedure as conducted for our buyout exits (described in section 4.1). Table 2-15 shows OLS regressions of the combined sample of 890 private equity trade sales. We include the same control variables and

fixed effects as in our previous analyses. The statistical specifications are also identical[95]. The table presents six Models. Models 1 to 3 analyze the impacts of industry relatedness (lateral versus synergetic) and other explanatory variables on PMEs of trade sales. While Model 1 shows the results for the combined sample, Models 2 and 3 display the results for the buyout and venture capital subsamples. Models 4 to 6 illustrate the same sample/subsample logic but the analyses also include the interaction terms of our moderating factors.

We see that the industry relatedness of buyer/target pairs has only a statistically significant impact for buyout transactions (*TS Class* statistically significant at the 5% significance level in Models 2 and 5). For venture capital trade sales this effect is statistically insignificant. This suggests that there is no return effect of industry relatedness in venture capital trade sales. However, based on the insignificance we cannot conclusively interpret the results. It is also interesting that the algebraic signs of the *TS Class* coefficients are different between the buyout and venture capital subsamples. The positive sign in the case of venture capital trade sales would imply a reverse effect of industry relatedness. This contradicts the findings of Achleitner et al. (2014), although we are not able to disprove them.

In the end, we only find the same main return effect of industry relatedness for buyout trade sales as Achleitner et al. (2014) do for venture capital deals. It is possible that our sample size of venture capital trade sales is too small and that this is the reason for the deviating results. Since the findings of Achleitner et al. (2014) are significant (but our venture capital results not) one may conclude that lateral buyers pay higher prices than synergistic acquirers in venture capital and buyout trade sales.

[95] Unit of analysis = private equity trade sale (exit); Huber-White sandwich estimators Huber (1967).

Table 2-15: OLS regressions on PME – lateral vs. synergetic trade sales

Sorted by GP's private equity type

Table 2-15 displays six OLS regressions (Models 1-6), estimating the effects of trade sale type (lateral vs. synergetic) and other explanatory variables on the PME returns of buyout and venture capital trade sales. Model 1 includes an extended sample of buyout and venture capital trade sales. Models 2 and 3 represent the respective subsamples. Models 4 to 6 follow the same sample/subsample logic but include in addition the interaction terms of moderating factors. All models estimate standard errors using Huber-White sandwich estimators (Huber, 1967) and incorporate year-, industry- and region-fixed effects. Time-fixed effects correspond to respective exit years. PME values are winsorized at the 99th percentile and are calculated in comparison to regional MSCI indices. *, ** and *** indicate significance at 10%, 5% and 1% level, respectively. The corresponding t-statistics are provided in parentheses.

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Dependent variable: PME (ln)	**BO&VC**	**Only BO**	**Only VC**	**BO&VC**	**Only BO**	**Only VC**
TS Class (lateral vs. synergetic)	-0.251**	-0.305**	0.216	-0.480*	-0.840**	0.489
	(-2.163)	(-2.247)	(0.817)	(-1.881)	(-2.578)	(0.923)
Holding Period (Years)	-0.076***	-0.028	-0.208***			
	(-3.036)	(-1.106)	(-4.747)			
GP Age (ln)	-0.171	-0.230**	-0.079			
	(-1.157)	(-2.130)	(-0.245)			
GP Inv. Capital until Exit (ln)	0.019	-0.032	0.031	-0.002	-0.036	-0.001
	(0.494)	(-0.885)	(0.261)	(-0.045)	(-0.977)	(-0.006)
GP Not US-based (Dummy)	-0.109	0.193	-0.704	-0.112	0.172	-0.771
	(-0.519)	(0.608)	(-1.065)	(-0.534)	(0.547)	(-1.167)
PE Competition	-46.286***	-20.666	-49.866*	-45.389***	-19.876	-48.331*
	(-4.533)	(-0.346)	(-1.932)	(-4.432)	(-0.337)	(-1.864)
Public Marekt Control Dummies (Reference normal Year)						
Boom Indicator (Dummy)	0.010	0.225	0.699			
	(0.034)	(0.657)	(0.504)			
Crisis Indicator (Dummy)	0.357	0.039	2.580*			
	(1.058)	(0.093)	(1.949)			
Holding period group (Dummy)				-0.313*	-0.272*	-0.840*
				(-1.951)	(-1.851)	(-1.659)
TS Class X *Holding Period group*				-0.119	0.228	-0.343
				(-0.505)	(0.899)	(-0.579)
GP Exp. group (Dummy)				-0.231	-0.290**	-0.341
				(-1.475)	(-2.093)	(-0.661)
TS Class X *GP Exp. group*				0.290	0.168	0.544
				(1.312)	(0.671)	(0.987)
MSCI Change Cat. (Dummy)				0.243	0.237	-1.417*
				(0.866)	(0.664)	(-1.857)
TS Class X *MSCI Change Cat.*				0.257	0.612**	-0.837
				(1.107)	(2.151)	(-1.629)
Year-fixed effects	YES	YES	YES	YES	YES	YES
Industry-fixed effects	YES	YES	YES	YES	YES	YES
Region-fixed effects	YES	YES	YES	YES	YES	YES
Constant	1.742***	1.619***	0.999*	0.985***	1.036***	2.179***
	(4.300)	(4.825)	(1.794)	(5.036)	(4.837)	(2.858)
Observations	890	609	281	890	609	281
R2	0.153	0.136	0.253	0.151	0.147	0.252

***Note*:** Differences between Model 5 in Table 2-15 and Model 11 in Table 2-13 stem from differences in the dummy variables *Holding Period group*, *GP Experience group* and *MSCI Change Category*. These dummy variables split the sample by the respective medians. Consequently, the median values are different, because the analyses in Table 2-15 incorporate venture capital trade sales as well (extended sample size = 890).

2.6.3. Contributions to literature and practical implications

Our findings contribute to several streams of the literature. Most importantly they further enhance the understanding of industry relatedness in the context of private equity trade sales. Our results about buyout trade sales complement the findings of Achleitner et al. (2014) about venture capital deals. We use a unique and comprehensive data sample including deal-level cash flows, a robust measure of private equity returns and a precise method for categorizing industry relatedness. This approach leads to reliable results for the context of buyout-backed trade sales, a field not yet discussed in research. Second, and based on our approach, our results contribute to existing research into industry relatedness in the context of general M&A (e.g., Fan and Goyal, 2006). They are in line with the work of Rigamonti (2012), who analyzes the effect of the knowledge bases of acquirer and target on innovative output. Her results suggest that too much relatedness comes along with too much overlapping and is not beneficial (Rigamonti, 2012). Our findings further contribute to the discussions about acquisition objectives like market power, efficiency gains, market entry, diversification or information access (among others, e.g., Lubatkin, 1987; Capron and Shen, 2007; King et al., 2008; Haleblian et al., 2009; Shenoy, 2012; Achleitner et al., 2014). Finally, our investigation of moderating effects in trade sales contributes to literature about optimal investment duration (e.g., Cumming and MacIntosh, 2003b; Kreuter et al., 2005; Schmidt et al., 2010; Cao and Lerner, 2009), the role of general partner experience (e.g., Gompers, 1996; Kaplan and Schoar, 2005; Cumming et al., 2009; Achleitner et al., 2014) and public market conditions (e.g., Cumming and MacIntosh, 2003b; Kreuter et al., 2005; Schmidt et al., 2010) in M&A transactions.

Our findings are relevant for buyout fund managers. They suggest that general partners can gain from differences in industry relatedness between potential buyers and portfolio companies in certain situations. Lateral buyers could be preferred if the general partner follows a 'buy-and-flip' strategy. Even after short holding periods the strategic acquisitions

objectives for lateral buyers can be achieved. Concerning return maximization, relatively young fund managers could compensate for their lack of experience in reducing information asymmetries by preferring lateral buyers. During times of moderate public market growth lateral trade sales also lead to higher returns. On the other hand, there is no need to distinguish between buyers according to industry relatedness when information asymmetries and differences in acquisition value considerations are less dominant. This should be the case after long holding periods, if the selling general partner is experienced or if the trade sale happens during a boom period of public markets. Overall, trade sales illustrate the globally dominant exit channel in private equity (Bain & Company, 2017) and general partners profit from a better understanding of the return differences connected to them. The key learning is that in certain situations higher returns can be achieved with lateral buyers.

2.6.4. Future research

Our investigation of return effects of industry relatedness in buyout-backed trade sales has some limitations and delivers suggestions for future research. First, our classification of industry relatedness is based on the coefficients reported by Fan and Lang (2000), the 1992 IO data and the 1987 SIC code system. Consequently, our analysis does not consider changes in industry definitions and IO relations over time. However, this limitation is qualified to some extent in the existing literature. Ahern (2012) remarks that IO relations between industries "are unlikely to change significantly over time" (Ahern, 2012, p. 533). Second, our analysis is based on the "Use Table" of Benchmark Input-Output Accounts by the Bureau of Economic Analysis, which is calculated on the US economy. Perhaps the global, European or Asian economies are structured differently in this regard. Using international industry commodity flows for the calculation of industry relatedness could enhance the validity of results. Third, and connected to the latter, it would be interesting to analyze a more comprehensive data sample. The geographical footprint of our study is limited because only 3% of all investigated trade sales were conducted outside North America or Europe. The

incorporation of more trade sales in the upcoming Asian private equity market could increase the understanding of industry relatedness in trade sales. Furthermore, the 656 buyout-backed trade sales in our sample were conducted between 1980 and 2013, whereby the median exit year is 2006. Therefore, it could deliver new insights to include more trade sales of earlier years and also recent transactions (exited after 2013). Last, we are not able to collect data about the decisions and discussions of general partners prior to the purchase of a respective portfolio company or during the investment duration. It is likely that some portfolio companies were bought with a specific exit strategy in mind and that this plan has been altered over time. Understanding the internal decision processes that lead to a trade sale would enhance the understanding of this exit channel. In this context and regarding the investigation of return effects, the incorporation of general partners' soft factors like specific knowledge or networks would also enhance the validity of analyses of return determinants.

2.7. Conclusion

In conclusion, this study enhances the understanding of the role of industry relatedness regarding investment returns in buyout trade sales. We find that buyout fund managers reach higher returns selling their portfolio companies to lateral rather than to synergetic buyers. This implies that unrelated buyers pay relatively more than related acquirers. Comparing lateral trade sales with more concrete types of synergetic transactions, we find that the separation in vertical and horizontal trade sales sheds light on return differences in certain situations. We do not find evidence that either horizontal or vertical relatedness drives the return difference between synergetic and lateral trade sales in general. Overall, this study shows that industry relatedness indeed matters in buyout trade sales and that it has a negative return effect. We explain this finding with differences in strategic acquisition objectives and levels of available information between lateral and synergetic buyers. Our results suggest that lateral-specific acquisition rationales such as market entry and information access outweigh synergetic-specific acquisition objectives like market power and efficiency gains in their influence of

bidding prices. Furthermore, our study underlines the importance of information asymmetry in the context of trade sales. We find that the return differences between lateral and synergetic trade sales are pronounced when levels of information asymmetry between the two buyer groups differ. This is the case if a portfolio company is held only for a short time by the selling general partner or if it is sold by a less experienced fund manager.

2.8. Appendix

See next page.

Table 2-16: OLS regressions on PME – lateral vs. synergetic trade sales (without c*ompetition* control variable)

This table serves as robustness test for the results of Table 2-13. We run the same regressions with specifications identical to those in Table 2-13. All variables are equal. In addition, we do not exclude the variable *PE Competition*. As a consequence, we analyze here 656 trade sales (and not just 609 as in Table 2-13). *, ** and *** indicate significance at 10%, 5% and 1% level, respectively. The corresponding t-statistics are provided in parentheses.

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
Dependent variable: PME (ln)	**All**	**Short inv. duration**	**Long inv. duration**	**Interaction inv. duration**	**Less exp.**	**More exp.**	**Interaction experience**	**Low MSCI growth**	**High MSCI growth**	**Interaction MSCI growth**	**Interaction All**
TS Class (later vs. synergetic)	-0.319**	-0.466**	-0.169	-0.447**	-0.466**	-0.286	-0.463***	-0.571**	-0.123	-0.601***	-0.839***
	(-2.522)	(-2.253)	(-0.987)	(-2.288)	(-2.529)	(-1.502)	(-2.668)	(-2.496)	(-1.024)	(-2.706)	-2.813
Holding Period (Years)	-0.028				0.026	-0.072**	-0.030	-0.001	-0.054***	-0.024	
	(-1.184)				(0.676)	(-2.463)	(-1.254)	(-0.014)	(-2.663)	(-0.992)	
GP Age (ln)	-0.192*	-0.062	-0.363**	-0.203*				-0.413**	0.044	-0.222**	
	(-1.760)	(-0.422)	(-2.077)	(-1.892)				(-2.091)	(0.381)	(-1.993)	
GP Inv. Capital until Exit (ln)	-0.049	-0.058	-0.020	-0.049	0.008	-0.093*	-0.045	-0.070	-0.036	-0.042	-0.038
	(-1.442)	(-1.047)	(-0.383)	(-1.445)	(0.172)	(-1.902)	(-1.289)	(-1.251)	(-0.852)	(-1.220)	(-1.068)
GP Not US-based (Dummy)	0.245	0.292	0.208	0.238	0.198	0.299	0.291*	0.117	0.282	0.228	0.269
	(1.419)	(1.141)	(0.744)	(1.376)	(0.993)	(0.962)	(1.672)	(0.449)	(1.182)	(1.325)	(1.553)
Public Marekt Control Dummies (Reference normal Year)											
Boom Indicator (Dummy)	0.154	0.526	-0.022	0.173	0.255	0.934***	0.246				
	(0.611)	(0.989)	(-0.072)	(0.740)	(0.639)	(2.793)	(0.968)				
Crisis Indicator (Dummy)	-0.050	-0.012	0.027	-0.082	0.213	0.508	-0.005				
	(-0.166)	(-0.027)	(0.069)	(-0.289)	(0.430)	(1.338)	(-0.015)				
Holding period group (Dummy)				-0.269**							-0.255*
				(-1.983)							-1.891
TS Class X H*olding Period Group*				0.265							0.243
				(1.110)							(1.007)
GP Exp. group (Dummy)							-0.378***				-0.394***
							(-2.940)				(-3.047)
TS Class X *GP Exp. Group*							0.290				0.233
							(1.245)				(0.999)
MSCI Change Cat. (Dummy)										0.328	0.422*
										(1.562)	(1.948)
TS Class X *MSCI Change Cat.*										0.571**	0.578**
										(2.211)	(2.263)
Year-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	1.560***	1.200*	1.655***	1.604***	0.332	0.702***	1.037***	1.988***	1.109*	1.576***	0.995***
	(4.810)	(1.894)	(3.776)	(4.871)	(0.933)	(3.736)	(4.411)	(3.736)	(1.949)	(4.917)	(5.510)
Observations	656	329	327	656	344	312	656	329	327	656	656
R2	0.140	0.187	0.128	0.141	0.194	0.188	0.144	0.204	0.083	0.148	0.154

Table 2-17: OLS regressions on investment multiple (IM) – lateral vs. synergetic trade sales

Table 2-17 serves as robustness test for the results of Table 2-13. The dependent variable is the investment multiple (instead of the PME). We calculate the IM as the division of total proceeds (dividends and proceeds from sale) received by a general partner and total capital invested in a portfolio company. We winsorize IMs at the investment level at the 99th percentile and use the natural logarithm. Apart from this the regressions, specifications and variables are identical to the analysis in Table 2-13. *, ** and *** indicate significance at 10%, 5% and 1% level, respectively. The corresponding t-statistics are provided in parentheses.

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
Dependent variable: IM (ln)	**All**	**Short inv. duration**	**Long inv. duration**	**Interaction inv. duration**	**Less exp.**	**More exp.**	**Interaction experience**	**Low MSCI growth**	**High MSCI growth**	**Interaction MSCI growth**	**Interaction All**
TS Class (later vs. synergetic)	-0.332**	-0.494**	-0.215	-0.481**	-0.380**	-0.387*	-0.398**	-0.627**	-0.146	-0.658**	-0.817**
	(-2.409)	(-2.260)	(-1.118)	(-2.308)	(-1.975)	(-1.882)	(-2.168)	(-2.351)	(-1.194)	(-2.549)	(-2.454)
Holding Period (Years)	0.039				0.094**	-0.013	0.036	0.091*	-0.005	0.043	
	(1.457)				(2.330)	(-0.397)	(1.350)	(1.776)	(-0.223)	(1.602)	
GP Age (ln)	-0.291***	-0.114	-0.406**	-0.261**				-0.580***	-0.001	-0.320***	
	(-2.711)	(-0.783)	(-2.228)	(-2.479)				(-2.964)	(-0.010)	(-2.891)	
GP Inv. Capital until Exit (ln)	-0.022	-0.036	0.017	-0.019	0.014	-0.082	-0.029	-0.021	-0.023	-0.013	
	(-0.615)	(-0.633)	(0.286)	(-0.533)	(0.275)	(-1.526)	(-0.777)	(-0.339)	(-0.532)	(-0.364)	
GP Not US-based (Dummy)	0.170	0.614	-0.127	0.161	-0.218	0.170	0.199	0.126	0.138	0.172	
	(0.530)	(1.264)	(-0.335)	(0.502)	(-0.530)	(0.399)	(0.620)	(0.281)	(0.374)	(0.539)	
PE Competition	-19.298	41.060	-58.523	-16.746	-84.030	-13.077	-19.667	-11.313	-27.665	-15.923	
	(-0.321)	(0.500)	(-0.983)	(-0.278)	(-1.199)	(-0.206)	(-0.330)	(-0.159)	(-0.457)	(-0.265)	
Public Marekt Control Dummies (Reference normal Year)											
Boom Indicator (Dummy)	0.227	0.912*	0.068	0.026	0.593	0.705*	0.280				
	(0.651)	(1.689)	(0.156)	(0.076)	(1.048)	(1.803)	(0.777)				
Crisis Indicator (Dummy)	-0.034	-0.624	0.200	-0.265	0.663	0.197	0.001				
	(-0.080)	(-1.349)	(0.384)	(-0.625)	(0.996)	(0.441)	(0.003)				
Holding period group (Dummy)				-0.099							-0.088
				(-0.674)							(-0.608)
TS Class X *Holding Period Group*				0.288							0.278
				(1.128)							(1.097)
GP Exp. group (Dummy)							-0.340**				-0.322**
							(-2.405)				(2.289)
TS Class X *GP Exp. Group*							0.124				0.055
							(0.513)				(0.229)
MSCI Change Cat. (Dummy)										0.136	-0.017
										(0.394)	(-0.048)
TS Class X *MSCI Change Cat.*										0.618**	0.587**
										(2.124)	(2.042)
Year-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	1.522***	1.417**	2.092***	1.873***	0.191	0.854***	0.789***	1.813***	1.741***	1.521***	1.135***
	(4.457)	(2.232)	(4.417)	(5.653)	(0.491)	(2.645)	(2.836)	(3.074)	(3.113)	(4.505)	(5.575)
Observations	609	317	292	609	320	289	609	284	325	609	609
R2	0.149	0.220	0.111	0.148	0.232	0.174	0.149	0.226	0.045	0.158	0.156

Table 2-18: OLS regressions on Internal Rate of Return (IRR) – lateral vs. synergetic trade sales

This table shows a robustness test of the results of Table 2-13. The dependent variable is the IRR (instead of the PME). The IRR is defined as the discount rate that produces a net present value of zero of all cash flows (contributions and distributions) between a general partner and her portfolio company. We winsorize IRRs at the investment level at the 99th percentile and use the natural logarithm of (1+IRR). Apart from this, the regressions, specifications and variables are identical to the analysis in Table 2-13. *, ** and *** indicate significance at 10%, 5% and 1% level, respectively. The corresponding t-statistics are provided in parentheses.

Model:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
Dependent variable: ln (1+IRR)	**All**	**Short inv. duration**	**Long inv. duration**	**Interaction inv. duration**	**Less exp.**	**More exp.**	**Interaction experience**	**Low MSCI growth**	**High MSCI growth**	**Interaction MSCI growth**	**Interaction All**
TS Class (later vs. synergetic)	-0.138*	-0.225*	-0.039	-0.220*	-0.157*	-0.133	-0.188**	-0.299*	-0.043	-0.307**	-0.415**
	(-1.902)	(-1.659)	(-1.004)	(-1.702)	(-1.909)	(-1.096)	(-2.326)	(-1.903)	(-0.855)	(-2.013)	(-2.249)
Holding Period (Years)	-0.029**				-0.014	-0.045***	-0.030**	0.015	-0.061***	-0.027**	0.143
	(-2.315)				(-0.751)	(-3.077)	(-2.445)	(0.582)	(-5.287)	(-2.053)	(0.819)
GP Age (ln)	-0.070	-0.059	-0.101**	-0.071				-0.216*	0.057	-0.085	
	(-1.268)	(-0.657)	(-2.334)	(-1.314)				(-1.802)	(1.237)	(-1.430)	
GP Inv. Capital until Exit (ln)	-0.013	-0.018	0.001	-0.014	-0.003	-0.021	-0.017	-0.006	-0.014	-0.009	-0.012
	(-0.867)	(-0.571)	(0.051)	(-0.902)	(-0.119)	(-1.206)	(-1.057)	(-0.242)	(-0.900)	(-0.590)	(-0.814)
GP Not US-based (Dummy)	0.140	0.356	0.007	0.131	-0.102	0.173	0.151	0.174	0.010	0.141	5.205
	(0.777)	(1.178)	(0.080)	(0.738)	(-0.552)	(0.698)	(0.850)	(0.814)	(0.082)	(0.783)	(0.133)
PE Competition	3.892	22.811	-7.285	3.135	-45.447	14.666	4.721	9.977	-21.362	5.649	
	(0.099)	(0.408)	(-0.526)	(0.079)	(-1.512)	(0.283)	(0.122)	(0.215)	(-0.967)	(0.142)	
Public Marekt Control Dummies (Reference normal Year)											
Boom Indicator (Dummy)	-0.062	0.451	-0.097	-0.042	0.137	0.237	-0.040				
	(-0.371)	(1.353)	(-1.025)	(-0.233)	(0.621)	(0.937)	(-0.231)				
Crisis Indicator (Dummy)	-0.274	-0.309	-0.099	-0.314	0.116	-0.112	-0.271				
	(-1.413)	(-1.555)	(-0.859)	(-1.503)	(0.454)	(-0.479)	(-1.420)				
Holding period group (Dummy)				-0.282***							-0.270***
				(-4.547)							(-4.423)
TS Class X *Holding Period Group*				0.180							0.162
				(1.374)							(1.164)
GP Exp. group (Dummy)							-0.106**				-0.111**
							(-1.978)				(-2.098)
TS Class X *GP Exp. Group*							0.100				0.072
							(0.880)				(0.565)
MSCI Change Cat. (Dummy)										-0.109	-0.069
										(-0.639)	(-0.342)
TS Class X *MSCI Change Cat.*										0.322*	0.314*
										(1.877)	(1.852)
Year-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constant	0.780***	0.605*	0.565***	0.805***	0.492**	0.405*	0.612***	0.740***	0.775***	0.780***	0.593***
	(5.507)	(1.859)	(5.355)	(5.085)	(2.570)	(1.691)	(4.793)	(2.927)	(2.761)	(5.551)	(7.847)
Observations	609	317	292	609	320	289	609	284	325	609	609
R2	0.151	0.190	0.147	0.160	0.230	0.215	0.152	0.193	0.165	0.161	0.170

III. Conclusion[96]

1. Summary of results and implications

This dissertation contributes to a better understanding of subtle mechanisms that drive private equity investment returns. First, the role of investment style drifts and their performance implications are investigated. Second, the return effects of industry relatedness in buyout-backed trade sales are analyzed. Although the two topics are not directly related to each other, both illustrate mechanisms that drive private equity returns. As private equity has become a major asset class with large amounts of committed capital and huge economic impact, the understanding of the less obvious success drivers in private equity is of practical and theoretical importance.

The first essay investigates determinants and performance implications of style drifts in private equity. In this context it contributes to the question whether there is an agency issue between general and limited partners related to this investment practice.

Starting with the determinants, it is found that the characteristics of general partners, the competition in the private equity market and public market conditions influence the style drifting activity of fund managers. Regarding the general partners' characteristics, the experience (measured by age) and size (measured by invested capital) of a fund manager show a negative effect on her style drift activity. An explanation for the experience effect is that experienced fund managers might be able to use their reputations and networks to find attractive investment opportunities within their ordinary investment foci (Langer et al., 2007). On the other side, low experience could lead to a low ability to find suitable targets. In combination with the negative size effect, it is argued that the two effects could be connected. Old private equity firms are often also large in size. This enables them to have diversified

[96] This section is partially based on the two essays in Section II.

portfolios that are less prone to style drifts because a substantial amount of capital has to be moved from one style to another to trigger drifting. The analysis reports further that buyout managers tend to drift more than venture capitalists. It is argued that the very active management of portfolio companies and the high degree of specialization typical for venture capitalists (Manigart et al., 2006; Achleitner and Braun, 2010 Achleitner et al., 2014) could restrict them within their investment foci.

Concerning external determinants of style drifting the following is found: First, there is some evidence that competition in the private equity market leads to more drifting activity. Since the competition variable is based on raised capital in the asset class, it comes along with investment pressure which could be a reason that fund managers drift under these circumstances. Second, the investigation shows that public market conditions have a significant impact on the drifting activity of general partners: they drift more during boom and less during recession periods.

The second part of the essay analyzes the performance implications of style drifts in private equity. There is a documented positive impact of style drift activity on the performance of buyout stage oriented general partners. This result implies a certain diversification effect of style drifts. For venture capitalists there is no significant impact of style drifting on performance observed. Splitting the sample according to high and low private equity competition, it is found that buyout fund managers drift more when competition is high. This observation combined with a positive interaction effect of style drifting and competition on general partners' performance suggests that fund managers opportunistically drift to increase returns during times of high investment pressure. It is inferred that these drifts are based on insider information or superior market/business judgment. The results therefore reject the possibility that fund managers drift by necessity, which means that they would drift because they are not able to find suitable investments within their investment foci. In conclusion, the essay finds no evidence for an agency issue between general and limited partners related to style drifts.

The essay contributes to existing literature about style drifting in private equity. Research about this specific topic is sparse and lacks a comprehensive analysis due to data limitations. Essay 1 extends the existing literature in three ways: First, it uses a comprehensive data sample that includes 12,426 unique private equity investments executed by 340 general partners over a time period of more than 40 years. The data contains information about portfolio companies' industry, geographical location and development stage, which makes it superior for the analysis of style drifts. In addition, gross cash flows between general partners and their portfolio companies are available that allow for a very precise and robust performance measurement. Not least, the sample includes investments from venture capitalists and buyout fund managers, which offers the opportunity to derive implications according to private equity manager type. Second, and based on the detailed data set, the essay analyzes the PME as performance measure. This measure allows for a direct benchmark to investments in public equity markets and includes a certain risk adjustment. It is therefore more expressive than traditional performance measures like the IRR or the IM. Third, the essay overcomes the limitation of style drift measurement to changes in the development stages of portfolio companies, which is mainly investigated in existing research. It applies a sophisticated style drift measure, developed by Bubna et al. (2015), which incorporates the key style-defining criteria: portfolio company's industry, geographical region, development stage and the capital share allocated in the portfolio companies. Overall, there is no research paper that incorporates all three of these aspects in its investigation. The essay therefore contributes to and extends the current understanding of style drifts in the private equity asset class. The identification of a positive performance effect of style drifting for buyout stage-oriented general partners is an important result that is also interesting for practitioners, especially investors. In addition, the essay connects style drifts to the discussion of a potential agency conflict between limited and general partners, thus enhancing the knowledge of principal-agent theory.

Essay 2 analyzes return differences of industry relatedness in buyout-backed trade sales. The investigation comprises 656 exits conducted by 134 general partners between 1980 and 2013. It is found that buyout fund managers can reach higher returns in lateral than in synergetic trade sales. The OLS regression shows that the PME of trade sales to synergetic buyers is 26.3% lower than trade sales to lateral acquirers. Considering moderating factors it is observed that the return difference is especially high when the holding period of a portfolio company is short, when the involved fund manager is less experienced or when public market conditions are less favorable. It is inferred that lateral-specific acquisition objectives like market entry and information access lead to a willingness to pay more for a target. It is further argued that an information disadvantage typical for unrelated buyers could lead to higher bidding prices. Because levels of available information assimilate between synergetic and lateral buyers over long holding periods or with the reputation of the selling general partner (Achleitner et al., 2014), return differences are not observed under these circumstances. Concerning the moderating effect of public market conditions on return differences of industry relatedness in buyout-backed trade sales the following interpretation is given: Periods of moderate economic growth reveal return differences of industry relatedness, because differentiating factors like strategic acquisition objectives or levels of information asymmetry matter more under those conditions. In boom periods such return differences are not observed, because deal competition leads to an assimilation of bidding prices.

Further, the essay investigates whether the return differences between lateral and synergetic trade sales are driven by vertical or horizontal deals (both are types of synergetic deals). There is some evidence that vertical and horizontal relatedness drive these differences in certain situations. Horizontal relatedness seems to affect the return differences between lateral and synergetic trade sales that are conducted after short holding periods or during times of moderate public market growth. Vertical relatedness, in contrast, tends to drive return differences when the general partner involved is less experienced.

The findings of Essay 2 contribute to several literature streams. They mainly enhance the understanding of industry relatedness in the context of private equity trade sales. While the research of Achleitner et al. (2014) provides first insights about return effects of industry relatedness in venture capital trade sales, this essay complements current research with results for buyout-backed trade sales. This is especially relevant in two ways: first, because buyout capital is the dominant type of private equity[97] and second, because strategic acquisition objectives and levels of available information of acquirers in buyout-backed trade sales are different from those in venture capital deals. Furthermore, the empirical analysis provides reliable results because it is based on a comprehensive and detailed data sample, a robust performance measure and a precise measurement of industry relatedness.

Additionally, the results contributes to existing research on industry relatedness in the context of general M&A (e.g., Fan and Goyal, 2006) and acquisition objectives like market power, efficiency gains, market entry, diversification or information access (e.g., Lubatkin, 1987; Capron and Shen, 2007; King et al., 2008; Haleblian et al., 2009; Shenoy, 2012; Achleitner et al., 2014). Finally, the essay delivers new insights for current discussion about optimal investment duration (e.g., Cumming and MacIntosh, 2003b; Kreuter et al., 2005; Schmidt et al., 2010; Cao and Lerner, 2009), the importance of fund manager experience (e.g., Gompers, 1996; Kaplan and Schoar, 2005; Cumming et al., 2009; Achleitner et al., 2014) and the influence of public market conditions (e.g., Cumming and MacIntosh, 2003b; Kreuter et al., 2005; Schmidt et al., 2010) in M&A transactions.

The findings also provide practical implications. General partners especially could gain from the insights documented in this essay. It can be argued that fund managers should prefer lateral buyers when following a 'buy-and-flip' strategy (short holding periods) or when public market growth is moderate. Furthermore, the results suggest that relatively young managers could compensate for their lack of experience by preferring unrelated buyers. On the other hand, the essay shows that there is less need to distinguish between buyers according to industry relatedness after long holding periods, if the selling general partner is experienced or

[97] Buyout funds represent the dominant type/fund category in private equity according to capital raised and dry powder (Bain & Company, 2016).

if the exit is conducted during an economic boom period. Overall, fund managers should profit from a better understanding of return differences of industry relatedness in trade sales and from the insight that higher returns can be achieved with lateral buyers in certain situations.

In conclusion, private equity has developed into a mature asset class, which has registered increasing levels of capital inflow and dry powder over recent years. This environment creates investment pressure for fund managers and high competition for interesting targets. Generating above average returns in this market is a current challenge for fund managers. While it has become customarily necessary to optimize the leverage, operations and strategy of a portfolio company or the exit timing of the deal, fund managers should be also aware of more subtle mechanisms that drive private equity returns. The research topics of this dissertation contribute to a better understanding of two of those subtle mechanisms: style drifts and industry relatedness. It is shown that style drifting at the general partner level and industry relatedness at the deal level have significant impacts on performance.

2. Future research and outlook

This dissertation investigates investment style drifts and industry relatedness in private equity. There is little research about either of these specific areas. However, the findings in this dissertation demonstrate the theoretical and practical relevance of these subtle mechanisms that drive private equity returns. The essays further provide suggestions for future research.

In general, research in private equity often suffers from data limitations (e.g. Kaplan and Schoar, 2005; Robinson and Sensoy, 2011; Harris et al., 2014) because of the private nature of this asset class and its few reporting obligations. However, as shown in this dissertation, detailed data is necessary to gain further insights about private equity performance. Future empirical research should use comprehensive and detailed data sets of high quality. Compared

to other research areas, the general data quality has to be further enhanced in private equity research.

Future research about style drifts in private equity should concentrate on the overarching topic of potential agency issues between limited and general partners. Due to data limitations, Essay 1 does not incorporate risk and return assessments on the level of investors' portfolios. Style drifting on the general partner level seems to be opportunistic and therefore in the interest of investors. However, this result is limited to return considerations. The risk component is only involved by using PMEs as performance measure. To investigate the risk per deal in greater detail and also limited partners' risk and return assessments on their portfolio levels would contribute to a deeper understanding of this investment practice.

While this dissertation takes an important step in the direction of a precise style drift measurement (based on Bubna et al., 2015), it is possible that one needs to apply an even more fine-grained industry differentiation for venture capital investments, because venture capitalists are highly specialized in very specific areas (Manigart et al., 2006; Achleitner and Braun, 2010).

Furthermore, it is likely that soft factors of general partners, like organizational structures or team-specific skills, influence the decisions that drive or lead to style drifting or to a sale to a specific buyer type. It would be interesting to analyze the internal decision processes of general partners on more detail. Concerning style drifting the following questions arise: Why do general partners decide to alter their investment focus? On what information do they base their decision? How do they handle increasing investment pressure? In which way do they consider changes in the risk profiles of their funds and for the portfolios of their investors? For the role of industry relatedness in private equity trade sales it would be interesting to answer the following: How actively do general partners involve the topic of industry relatedness between the portfolio company and a potential acquirer in their exit plan and negotiation strategies? How do fund managers exploit different strategic acquisition

objectives and levels of available information of potential buyers? How and when do they alter their exit plans? Overall, the consideration of soft factors on the general partner level provides great potential for future research.

As a last point, the strong growth of the private equity asset class over the last years has led to a competitive environment with high investment pressure. This current period is very interesting for research. It especially has potential for more insights on subtle drivers of return as those discussed in this dissertation. How and whether general partners can generate above average returns in a market of increasing capital commitments and record levels of dry powder, is yet to be analyzed. It can be assumed that extreme conditions will reveal more determinants and drivers of private equity success. In this context, it is also a methodological challenge to measure investment pressure accurately. In the end, it will be essential for limited partners and fund managers to be aware of all performance drivers in private equity, especially the subtle ones.

References

Achleitner, A.K., Braun, R., 2010. The impact of investment strategy on risk and return in venture capital and private equity funds. Working Paper, Technical University of Munich.

Achleitner, A.K., Braun, R., Lutz, E., Reiner, U., 2012. Venture capital firm returns from acquisition exits. Working paper, 2012-01, Technical University of Munich.

Achleitner, A.K., Braun, R., Lutz, E., Reiner, U., 2014. Industry relatedness in trade sales and venture capital investment returns. Small Business Economics 43 (3), 621–637.

Ahern, K.R., 2012. Bargaining power and industry dependence in mergers. Journal of Financial Economics 103 (3), 530–550.

Akerlof, G.A., 1970. The market for "Lemons": Quality uncertainty and the market mechanism. The Quarterly Journal of Economics 84 (3), 488–500.

Audretsch, D.B., Acs, Z.J., 1994. New-firm startups, technology, and macroeconomic fluctuations. Small Business Economics 6 (6), 439–449.

Axelson, U., Strömberg, P., Weisbach, M.S., 2009. Why are buyouts levered? The financial structure of private equity funds. The Journal of Finance 64 (4), 1549–1582.

Bain & Company, Inc., 2016. Global Private Equity Report.

Bain & Company, Inc., 2017. Global Private Equity Report.

Barney, J.B., 1988. Returns to bidding firms in mergers and acquisitions: Reconsidering the relatedness hypothesis. Strategic Management Journal 9 (S1), 71–78.

Berger, P.G., Ofek, E., 1995. Diversification's effect on firm value. Journal of Financial Economics 37 (1), 39–65.

Bouwman, C.H.S., Fuller, K., Nain, A.S., 2009. Market valuation and acquisition quality: Empirical evidence. The Review of Financial Studies 22 (2), 633–679.

Braun, R., Jenkinson, T., Stoff, I., 2017. How persistent is private equity performance? Evidence from deal-level data. Journal of Financial Economics 123 (2), 273–291.

Bruner, R.F., 2002. Does M&A pay? A survey of evidence for the decision-maker. Journal of Applied Finance 12 (1), 48–68.

Bruner, R.F., 2004. Where M&A pays and where it strays: A survey of the research. Journal of Applied Corporate Finance 16 (4), 63–76.

Bubna, A., Das, S.R., Hanouna, P., 2015. The fast and the curious: VC drift. Working Paper, Indian School of Business, Santa Clara University, Villanova School of Business.

Bureau of Economic Analysis, 2017. Benchmark Input-Output data - 1992 benchmark I-O SIC-based table six-digit transactions. https://www.bea.gov/industry/io_benchmark.htm#1992data. Accessed 30 December 2017.

Buzzacchi, L., Scellato, G., Ughetto, E., 2015. Investment stage drifts and venture capital managerial incentives. Journal of Corporate Finance 33, 118–128.

Cameron, A.C., Gelbach, J.B., Miller, D.L., 2011. Robust inference with multiway clustering. Journal of Business & Economic Statistics 29 (2), 238–249.

Cao, J., Lerner, J., 2009. The performance of reverse leveraged buyouts. Journal of Financial Economics 91 (2), 139–157.

Capron, L., Shen, J., 2007. Acquisitions of private vs. public firms: Private information, target selection, and acquirer returns. Strategic Management Journal 28 (9), 891–911.

Cefis, E., Marsili, O., Rigamonti, D., 2015. Industry relatedness and post-acquisition innovative performance. Academy of Management Proceedings (Vol. 2015, No. 1, p. 17260). Academy of Management.

Chatterjee, S., 1986. Types of synergy and economic value: The impact of acquisitions on merging and rival firms. Strategic Management Journal 7 (2), 119–139.

Chen, Y., 2001. On vertical mergers and their competitive effects. RAND Journal of Economics 32 (4), 667–685.

Cloodt, M., Hagedoorn, J., van Kranenburg, H., 2006. Mergers and acquisitions: Their effect on the innovative performance of companies in high-tech industries. Research Policy 35 (5), 642–654.

Coase, R.H., 1937. The nature of the firm. Economica 4 (16), 386–405.

Coase, R.H., 1972. Industrial organization: A proposal for research, in V. R. Fuchs (ed.), Policy issues and research opportunities in industrial organization. National Bureau of Economic Research, New York, 59–73.

Comment, R., Jarrell, G.A., 1995. Corporate focus and stock returns. Journal of Financial Economics 37 (1), 67–87.

Cumming, D.J., Fleming, G., Schwienbacher, A., 2009. Style drift in private equity. Journal of Business Finance & Accounting 36 (5-6), 645–678.

Cumming, D.J., MacIntosh, J.G., 2001. Venture capital investment duration in Canada and the United States. Journal of Multinational Financial Management 11 (4), 445–463.

Cumming, D.J., MacIntosh, J.G., 2003a. A cross-country comparison of full and partial venture capital exits. Journal of Banking & Finance 27 (3), 511–548.

Cumming, D.J., MacIntosh, J.G., 2003b. Venture-capital exits in Canada and the United States. The University of Toronto Law Journal 53 (2), 101–199.

Das, S.R., Jagannathan, M., Sarin, A., 2003. Private equity returns: An empirical examination of the exit of venture-backed companies. Journal of Investment Management 1 (1), 1–26.

De Clercq, D., Goulet, P.K., Kumpulainen, M., Mäkelä, M., 2001. Portfolio investment strategies in the Finnish venture capital industry: A longitudinal study. Venture Capital 3 (1), 41–62.

Degeorge, F., Martin, J., Phalippou, L., 2016. On secondary buyouts. Journal of Financial Economics 120 (1), 124–145.

Demaria, C., 2013. Introduction to private equity: Venture, growth, LBO and turn-around capital, 2nd ed. John Wiley & Sons, West Sussex, United Kingdom.

Eckbo, B.E., 1983. Horizontal mergers, collusion, and stockholder wealth. Journal of Financial Economics 11 (1-4), 241–273.

Eckbo, B.E., 1992. Mergers and the value of antitrust deterrence. The Journal of Finance 47 (3), 1005–1029.

Fan, J.P.H., Goyal, V.K., 2006. On the patterns and wealth effects of vertical mergers. Journal of Business 79 (2), 877–902.

Fan, J.P.H., Lang, L.H.P., 2000. The measurement of relatedness: An application to corporate diversification. Journal of Business 73 (4), 629–660.

Fleming, G., 2010. Institutional investment in private equity: Motivations, strategies, and performance, in D. Cumming ed., Private equity: Fund types, risks and returns and regulations. John Wiley & Sons, Inc., New Jersey, 7–29.

Gompers, P., Kovner, A., Lerner, J., Scharfstein, D., 2008. Venture capital investment cycles: The impact of public markets. Journal of Financial Economics 87 (1), 1–23.

Gompers, P., Lerner, J., 2000. Money chasing deals? The impact of fund inflows on private equity valuation. Journal of Financial Economics 55 (2), 281–325.

Gompers, P.A., 1996. Grandstanding in the venture capital industry. Journal of Financial Economics 42 (1), 133–156.

Gompers, P.A., Lerner, J., 2004. The venture capital cycle. MIT press, Cambridge, MA.

Gupta, A.K., Sapienza, H.J., 1992. Determinants of venture capital firms' preferences regarding the industry diversity and geographic scope of their investments. Journal of Business Venturing 7 (5), 347–362.

Haleblian, J., Devers, C.E., McNamara, G., Carpenter, M.A., Davison, R.B., 2009. Taking stock of what we know about mergers and acquisitions: A review and research agenda. Journal of Management 35 (3), 469–502.

Harris, R.S., Jenkinson, T., Kaplan, S.N., 2014. Private equity performance: What do we know? The Journal of Finance 69 (5), 1851–1882.

Hart, O., Tirole, J., Carlton, D.W., Williamson, O.E., 1990. Vertical integration and market foreclosure. Brookings papers on economic activity. Microeconomics 1990, 205–286.

Hendricks, K.B., Singhal, V.R., Zhang, R., 2009. The effect of operational slack, diversification, and vertical relatedness on the stock market reaction to supply chain disruptions. Journal of Operations Management 27 (3), 233–246.

Higson, C., Stucke, R., 2012. The performance of private equity. Working Paper, London Business School, Oxford University.

Huber, P.J., 1967. The behavior of maximum likelihood estimates under nonstandard conditions. Proceedings of the fifth Berkeley symposium on mathematical statistics and probability 1 (1), 221–233.

Jensen, M.C., Meckling, W.H., 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics 3 (4), 305–360.

Kahle, K.M., Walkling, R.A., 1996. The impact of industry classifications on financial research. Journal of Financial and Quantitative Analysis 31 (03), 309–335.

Kaplan, S.N., Schoar, A., 2005. Private equity performance: Returns, persistence, and capital flows. The Journal of Finance 60 (4), 1791–1823.

Kaplan, S.N., Strömberg, P., 2009. Leveraged buyouts and private equity. The Journal of Economic Perspectives 23 (1), 121–146.

King, D.R., Slotegraaf, R.J., Kesner, I., 2008. Performance implications of firm resource interactions in the acquisition of R&D-intensive firms. Organization Science 19 (2), 327–340.

Kreuter, B., Gottschalg, O., Zollo M., 2005. Truths and myths about determinants of buyout performance. Working Paper, INSEAD.

Langer, B., Lauterbach, R., Welpe, I., 2007. Antecedents and performance implications of style drift in private equity investments. Working Paper, Johann Wolfgang Goethe-University, Ludwig-Maximilians-University.

Ljungqvist, A., Richardson, M., 2003a. The cash flow, return and risk characteristics of private equity. Working Paper, New York University.

Ljungqvist, A., Richardson, M.P., 2003b. The investment behavior of private equity fund managers. Working Paper, New York University.

Lopez-de-Silanes, F., Phalippou, L., Gottschalg, O., 2015. Giants at the gate: Investment returns and diseconomies of scale in private equity. Journal of Financial and Quantitative Analysis 50 (03), 377–411.

Lubatkin, M., 1987. Merger strategies and stockholder value. Strategic Management Journal 8 (1), 39–53.

Manigart, S., Lockett, A., Meuleman, M., Wright, M., Landström, H., Bruining, H., Desbrières, P., Hommel, U., 2006. Venture capitalists' decision to syndicate. Entrepreneurship Theory and Practice 30 (2), 131–153.

Mann, H.B., Whitney, D.R., 1947. On a test of whether one of two random variables is stochastically larger than the other. The Annals of Mathematical Statistics (18), 50–60.

Markides, C.C., Ittner, C.D., 1994. Shareholder benefits from corporate international diversification: Evidence from US international acquisitions. Journal of International Business Studies 25 (2), 343–366.

Martin, J.D., Sayrak, A., 2003. Corporate diversification and shareholder value: a survey of recent literature. Journal of Corporate Finance 9 (1), 37–57.

Martin, R., Sunley, P., Turner, D., 2002. Taking risks in regions: the geographical anatomy of Europe's emerging venture capital market. Journal of Economic Geography 2 (2), 121–150.

Miller, D.J., Fern, M.J., Cardinal, L.B., 2007. The use of knowledge for technological innovation within diversified firms. Academy of Management Journal 50 (2), 308–326.

Mittelman, M., 2017. Why Private Equity Has $963 Billion in Dry Powder. https://www.bloomberg.com/news/articles/2017-09-01/why-private-equity-has-963-billion-in-dry-powder-quicktake-q-a. Accessed 13 September 2017.

Mooney, A., 2017. Private equity fundraising hits post-crisis high. https://www.ft.com/content/906b2b86-828c-11e7-94e2-c5b903247afd. Accessed 13 September 2017.

Nocke, V., White, L., 2007. Do vertical mergers facilitate upstream collusion? The American Economic Review 97 (4), 1321–1339.

Ordover, J.A., Saloner, G., Salop, S.C., 1990. Equilibrium vertical foreclosure. The American Economic Review 80 (1), 127–142.

Petersen, M.A., 2009. Estimating standard errors in finance panel data sets: Comparing approaches. The Review of Financial Studies 22 (1), 435–480.

Pfeffer, J., 1972. Merger as a response to organizational interdependence. Administrative Science Quarterly 17, 382–394.

Phalippou, L., Gottschalg, O., 2009. The performance of private equity funds. The Review of Financial Studies 22 (4), 1747–1776.

Puche, B., Braun, R., Achleitner, A., 2015. International evidence on value creation in private equity transactions. Journal of Applied Corporate Finance 27 (4), 105–122.

Raudszus, M., Schiereck, D., Trillig, J., 2014. Does vertical diversification create superior value? Evidence from the construction industry. Review of Managerial Science 8 (3), 293–325.

Reuer, J.J., 2005. Avoiding lemons in M&A deals. MIT Sloan Management Review 46 (3), 15–17.

Rigamonti, D., 2012. Industry relatedness in M&A. An empirical analysis on acquisitions, innovation, and leveraged buyouts. Doctorial Dissertation. https://aisberg.unibg.it/retrieve/handle/10446/28628/11441/D.%20Rigamonti%20-%20Doctoral%20thesis.pdf. Accessed 24 February 2018.

Robinson, D.T., Sensoy, B.A., 2011. Private equity in the 21st century: Liquidity, cash flows, and performance from 1984-2010. Working Paper, Duke University, Ohio State University.

Sahlman, W.A., 1990. The structure and governance of venture-capital organizations. Journal of Financial Economics 27 (2), 473–521.

Salinger, M.A., 1988. Vertical mergers and market foreclosure. The Quarterly Journal of Economics 103 (2), 345–356.

Schmidt, D.M., Steffen, S., Szabo, F., 2010. Exit strategies of buyout investments: an empirical analysis. The Journal of Alternative Investments 12 (4), 58–84.

Seth, A., 1990. Value creation in acquisitions: A re-examination of performance issues. Strategic Management Journal 11 (2), 99–115.

Shenoy, J., 2012. An examination of the efficiency, foreclosure, and collusion rationales for vertical takeovers. Management Science 58 (8), 1482–1501.

Singh, H., Montgomery, C.A., 1987. Corporate acquisition strategies and economic performance. Strategic Management Journal 8 (4), 377–386.

Sorensen, M., Jagannathan, R., 2015. The public market equivalent and private equity performance. Financial Analysts Journal 71 (4), 43–50.

Sorensen, M., Wang, N., Yang, J., 2014. Valuing private equity. The Review of Financial Studies 27 (7), 1977–2021.

Spence, M., 1973. Job market signaling. The Quarterly Journal of Economics 87 (3), 355–374.

Stiglitz, J.E., 1975. The theory of "screening," education, and the distribution of income. The American Economic Review 65 (3), 283–300.

Stucke, R., 2011. Updating history. Working Paper, University of Oxford.

Talmor, E., Vasvari, F., 2011. International private equity. John Wiley & Sons.

Thompson, S.B., 2011. Simple formulas for standard errors that cluster by both firm and time. Journal of Financial Economics 99 (1), 1–10.

Trautwein, F., 1990. Merger motives and merger prescriptions. Strategic Management Journal 11 (4), 283–295.

United States Department of Labor, 2017. SIC Division Structure. https://www.osha.gov/pls/imis/sic_manual.html. Accessed 30 December 2017.

Villalonga, B., McGahan, A.M., 2005. The choice among acquisitions, alliances, and divestitures. Strategic Management Journal 26 (13), 1183–1208.

Walker, M.M., 2000. Corporate takeovers, strategic objectives, and acquiring-firm shareholder wealth. Financial Management 29, 53–66.

Wilcoxon, F., 1945. Individual comparisons by ranking methods. Biometrics Bulletin 1 (6), 80–83.

Wooldridge, J.M., 2009. Introductory Econometrics: A modern approach. South-Western.

Zhu, P., Jog, V., 2009. Information asymmetry and acquisition premiums in domestic and cross border M&As in emerging markets. Working Paper, Northern Finance Association.