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Essays on Value Creation and its Determinants in Private Equity

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“[…] (I heard) the Beatles song, ‘Yesterday’, which has the lyrics, ‘Yesterday, love was such an easy game to play.’ It made me think about getting deals done today. Yesterday, private equity was such an easy game to play.”

John D. Howard, CEO of Irving Place Capital

Table of Contents – Overview

Table of Contents

List of Figures

List of Tables

List of Abbreviations

$\frac{D}{E}$	Debt-to-equity ratio
e.g.	exempli gratia
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortization
et al.	et alii
EV	Enterprise Value
FCF	Free Cash Flow
GP	General Partner
i.e.	id est
ICB	Industry Classification Benchmark
IRR	Internal Rate of Return
LBO	Leveraged Buyout
LIBOR	London Interbank Offered Rate
LP	Limited Partner
MAJ	Majority investment
MIN	Minority investment
MM	Money Multiple

MSCI	Morgan Stanley Capital International
OLS	Ordinary Least Squares
p.a.	per annum
PE	Private Equity
PIPE	Private Investment in Public Equity
PME	Public Market Equivalent
TM	Times Money
S&P	Standard & Poor's
UK	United Kingdom
US	United States of America
USD	United States Dollar
VC	Venture Capital
vs.	versus
r_D	Total cost of debt during holding period

1 Introduction

1.1 Motivation and Research Topic

Since the first transactions in the early 20th century, private equity (PE) has developed into a major asset class.[1] Together with hedge funds and infrastructure investments, it is considered an alternative asset class. What is named PE typically includes venture capital (VC) and buyouts as the major parts of the asset class. Other investment types that are also referred to as PE include mezzanine investing, private real estate transactions, and private investments in public equity (PIPEs). However, the term PE in the most common use refers to VC and buyouts. Whereas VC encompasses investments in young or growing companies with the clear goal of participating in future growth, buyouts mean investments in more mature companies, usually with a proven business model and a less volatile development of the business. All of the investment types typically called PE have in common that they refer to investments in non-public companies or projects. In the case of PIPEs, this is not always the case, although investors often intend to take the company private at a later point in time. In this thesis, the term PE will be used meaning buyouts, i.e., not including VC.[2]

The PE industry works on a closed fund basis. It includes the investors, the private equity firms and the portfolio companies. The investors, who serve as limited partners (LPs) in those funds are, among others, institutional investors like insurance companies, pension funds,

[1] Depending on the definition, the beginning is usually seem in the 1930s for venture capital and in the 1960s for buyouts, when so-called small-business investment companies were first allowed in the US to leverage federal funds to lend to small companies. A real boom started in the 1970s and 1980s, when the capital gains tax in the US was lowered and when US pension funds were allowed to invest in private equity funds (Desbrières and Schatt (2002), Kaplan and Strömberg (2009), Talmor and Vasvari (2011)).

[2] For an overview see Cumming et al. (2007), Kaplan and Strömberg (2009) and Metrick and Yasuda (2011).

endowment funds, and wealthy individuals. They commit capital to the PE funds which are managed by the PE firms, who are taking the role of general partners (GPs) of the funds. These funds are typically set up for ten years, with the possibility to be extended if necessary. During the first five years, the so-called investment period, the GPs invest in portfolio companies, using the equity capital from the fund and additional debt capital provided by banks. The aim is to invest in a majority stake of the portfolio companies with the clear prospect of selling them after a usual holding period of four to seven years. During the second five years, the so-called harvesting period, GPs hold the portfolio companies and aim at selling them profitably. While holding the portfolio companies, GPs differ in their focus on how to achieve such a profitable exit. Some rely more on the use of debt financing; others, on changes in market prices; still others, on operating improvements within the portfolio companies (Kaplan and Strömberg (2009)).

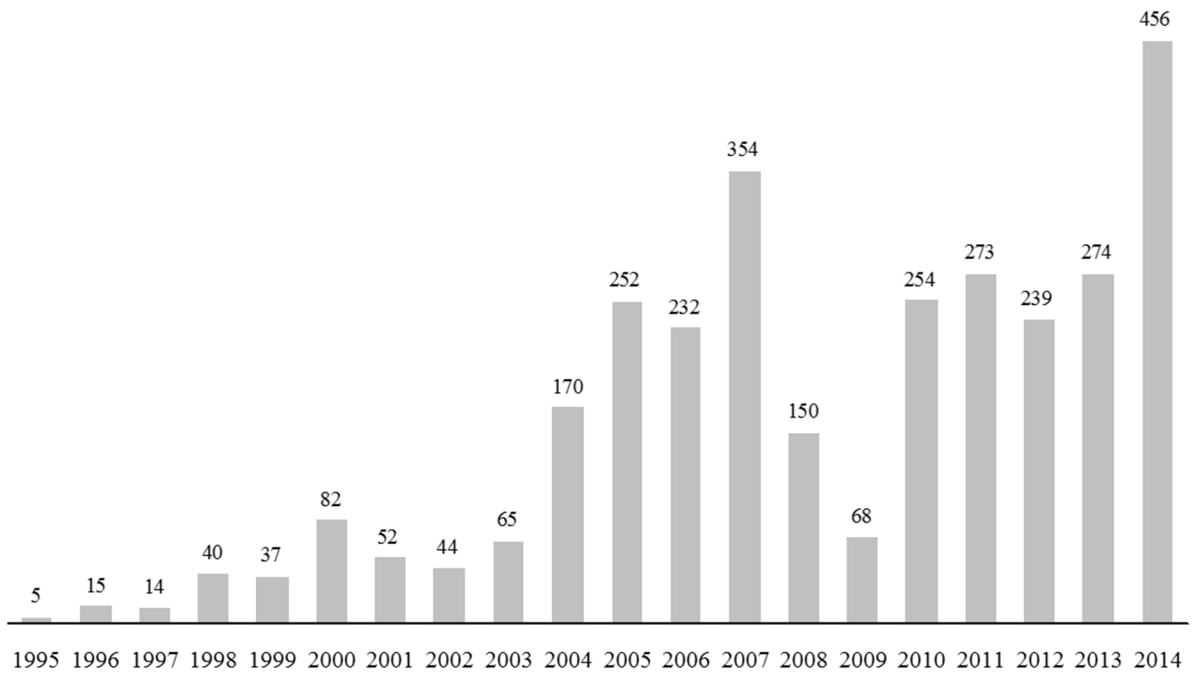
The usual compensation of the GPs contains two elements (Litvak (2009), Axelson et al. (2009), Metrick and Yasuda (2011)). One is a fixed management fee that is typically 2% p.a. of committed capital during the investment period and the same percentage of invested capital during the harvesting period. The idea behind this is to provide the GP with a remuneration that covers for its cost of sourcing and managing the portfolio companies, and managing the fund. The second element is a fee depending on the performance of the transactions. This carried interest is typically 20% of any profits above a hurdle rate of 8% p.a.[3] The difference in returns for the GP or the fund (gross of fees) and the investors in the fund (net of fees) consists of these fees retained by the GP for his fund and investment management.

[3] There are further fees, usually paid by the portfolio companies that are not standardized. This can be transaction, monitoring or advisory fees.

The size of the PE industry can be measured by the monetary values of the companies that are sold by PE funds in a certain year. An analysis over time shows that the value of exit transactions from buyouts has increased drastically over the course of the years. Bain & Company (2015) report a record-high value of global buyout-backed exits, i.e., sales of portfolio companies that were previously bought by PE companies in the course of a buyout, of USD 546 bn in 2015. The study also shows that the previous high was at USD 354 bn in 2007, before the financial crisis caused a low in exit values of only USD 68 bn in 2009. Since then, the volume has strongly picked up again.

Figure 1-1: Value of Global Buyout-backed Exits

This figure shows the development of buyout-backed exits by year in USD billion from 1995-2014 and excludes bankruptcies. The figure is based on Bain & Company (2015).

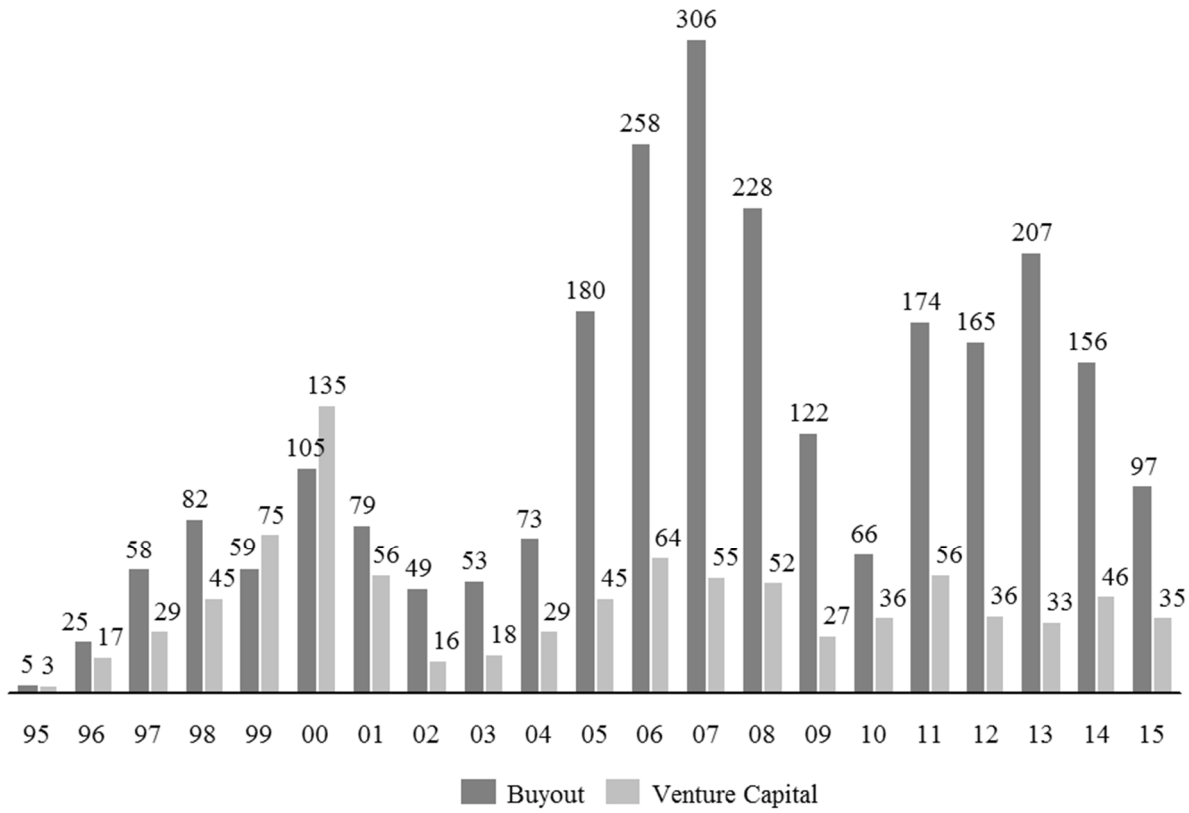


Another indicator for the industry's size are fundraising volumes, i.e., the amount of capital newly set up funds raised in a given year, which show a very similar picture. Bain & Company (2015) report USD 499 bn in PE capital raised for 2014, slightly below the value in 2013. The record-high year was in 2008 with USD 685 bn, before fundraising dropped in the aftermath of

the financial crisis until 2011. Kaplan and Strömberg (2009) also find a record-high value in the global PE fundraising volume in 2007 and a decline thereafter.

Figure 1-2: Private Equity Fundraising Volume by Year

This figure presents global PE fundraising volumes by year in USD billion from 1995-2015. The figure includes 3,700 buyout and 8,828 venture capital funds. Generalist PE, Mezzanine and Other PE funds are excluded. Data is provided by Thomson One.



As can be seen, PE is subject to ups and downs in both the number of exits as in fundraising volumes. Acharya et al. (2007) show that in the late 1980s and early 1990s buyout volumes decreased, and in consequence they picked up strongly until the global financial crisis in 2008. After the financial crisis, it again took some years for PE to pick up and reach pre-crisis levels. In the past years, fundraising has slowed down while exit volumes have reached a record-high.

Concerning the regional distribution, PE started in North America[4] and is still represented strongest there, while Europe has picked up considerably during the past 30 years, Asia is still developing strongly as a region for PE activity (Strömberg (2008)). This includes both investors from Asia as well as foreign investors who focus on this region in their search for portfolio companies. Whether Asia will mature like North America and Europe have done and are still doing – with more standardized processes, more elaborate transaction structuring and more focus on operating improvements – remains to be seen.[5]

PE shows a dynamic development and is an industry that is still maturing and developing further. Its size has grown over the course of the years and continues to do so. This is true in number of transactions, in transaction values and in capital committed to PE funds. Sensoy et al. (2014) argue that the PE is becoming increasingly mature, seen by its changes in size, composition and in the way the actors participate in the industry. They close with the conclusion that "[PE] has always been an industry that has been evolving at a rapid rate"[6], and that it is important in this respect to understand this maturing industry. As an industry that is still growing and undergoing dynamic developments, Private Equity requires further and more detailed research to thoroughly understand the underlying mechanisms.

At the heart of understanding how Private Equity works and how it generates returns for its investors is value creation. While the funds are the vehicles LPs invest in, individual deals are what the daily business is about and what ultimately drives fund returns. This dissertation

[4] PE got its first boost in the 1970s in the US with the capital gains tax reduction (Talmor and Vasvari (2011)).

[5] See Cumming et al. (2010) on challenges relating to legal protection in Asian PE deals. The authors find that legal protection is important for achieving returns, but also that PE managers are able to mitigate corruption potential.

[6] Sensoy et al. (2014), p.342.

focuses on value creation and its determinants in PE, as the key driver of deal and thus fund performance. It builds on the understanding that PE is a still maturing industry that needs to be further and better understood and to this end uses the strength of deal-level data. The available data on value creation within these deals provides great detail for understanding how value creation differs between individual transactions. The dissertation analyzes value creation and its determinants in Private Equity. It provides an overview of how value creation and its drivers have developed over time and how they differ by market segments. It analyzes the influence of deal pricing as one distinct driver of value creation. Lastly, it analyzes value creation in PE minority investments as one evolving type of investment. These topics benefit GPs as well as LPs. GPs are presented with alternative approaches for understanding their daily business. LPs are provided with an overview of how value creation in PE differs between market segments, as well as individual drivers of value creation that they may want to look for in deciding which GP to provide capital to. This dissertation thus helps to better understand value creation in PE as one of the key drivers of returns. It provides an important guide to successfully navigating in this still growing and further maturing industry.

1.2 Literature Overview

As PE is still a young industry by other asset classes' standards, research about PE is also young, with the first publications in the late 1980s (Jensen (1986), Jensen (1989), Kaplan (1989)). Due to a lack of available data, many previous studies do not clearly focus on either venture capital or buyouts and draw conclusions from mixed samples or mechanisms that hold true for both types of investments. While maintaining a focus on buyouts, this overview will draw conclusions from venture capital research as well.

Existing findings on private equity can be grouped as follows. Research on performance analyzes the returns of private equity funds and deals, as well as questions about whether individual PE firms are able to constantly generate higher returns than others. Closely related is research on risk. Another stream deals with the value creation within the investments by PE firms, based on the use of leverage, achieving operating improvements or transaction price increases. Research on value creation is scarce due to the low availability of detailed deal-level data necessary for these analyses. Based on research on performance and value creation are studies on whether GPs are able to develop a set of skills they use in achieving high deal returns or whether this is rather thanks to luck. Another stream of research analyzes how specializing or diversifying the investment scope influences deal and fund returns. Combining these findings and developing expectations about the future development is research about the state of maturity of PE.

1.2.1 Performance

Research on performance makes up the bulk of research on private equity. The availability of fund-level data is high and so are findings on fund level, owing to several publicly available databases. Studying returns of individual deals is more difficult, as it requires detailed deal-

level data, including return figures. As deal-level data is less available, the studies are fewer, but present higher transparency thanks to the details available.[7]

The difference in return figures between the subjects regarded is crucial to keep in mind. Gross figures on the level of the deal or the fund present the returns before fees for the GP are deducted. Deal-level data usually presents gross-of-fee data, as fees are not typically deducted on the level of the individual transaction.[8] Deal-level data can either be aggregated based on gross deal returns or be obtained from GPs or LPs net of fees. In this case, the returns are already reduced by management fees and carried interest kept by the GP, so they present actual returns for the LPs.

Substantial research exists on the performance of PE funds. Results by Ljungqvist and Richardson (2003) provide strong evidence for PE outperformance of public alternatives. In their sample of funds from 1981-2001, they find that PE generates excess returns net of fees of over 5% p.a. compared to the S&P 500. They interpret this as an illiquidity compensation for investors, who commit capital to the funds for usually ten years. In their seminal piece, Kaplan and Schoar (2005) first define the Public Market Equivalent (PME) on a fund level, a comparison of an investment in a PE fund to an investment in a market index with equal size and timing. They find that average net fund returns are slightly below an investment in the S&P 500.[9] Phalippou and Gottschalg (2009) use a comparable sample from the same source[10] and

[7] See Harris et al. (2012) on the difficulty of collecting data.

[8] Depending on the carried interest payout agreement, it can either be calculated based on each deal's performance (American waterfall) or on the fund's performance based on all deals (European waterfall). Management fees are calculated based on committed or invested capital of the fund (Talmor and Vasvari (2011), Metrick and Yasuda (2010)).

[9] The sample is from Thomson Venture Economics (now Thomson One) covering a period from 1980-2001 that contains venture capital as well as private equity funds.

[10] The sample is also from TVE and covers funds from 1980-2003.

find similar results to Kaplan and Schoar (2005), with an average 3% underperformance net of fees per year, compared to the S&P 500, which corresponds to an average 3% outperformance gross of fees per year. For a sample of funds originating from the Cambridge Associates database, Higson and Stucke (2012) find similar results, namely that US buyout funds significantly outperformed the S&P 500 by 4.5% p.a. gross of fees between 1980 and 2000. Based on a more recent sample from Burgiss, Harris et al. (2014a) find a 3% yearly outperformance of buyout funds compared to the S&P 500 on average, net of fees. The results also show that until the late 1990s, there was substantial outperformance of buyouts and that this has turned into underperformance since. For a proprietary sample of funds from 1984-2010 Robinson and Sensoy (2011) find an 18% outperformance compared to the S&P 500, net of fees over the life of the fund.[11] Comparing PE's net returns to the MSCI world, Meerkatt et al. (2008) find that, on a risk-adjusted basis, PE does not outperform public markets.

Measuring the performance of individual PE deals is standardized at least by the measures used. Most common are the internal rate of return (IRR), the money multiple (MM)[12] and the PME. While the IRR calculates the rate of return at which the net present value equals zero and thus takes the aspect of time into account, the MM relates all distributed capital from a deal to all investments into that same deal, independent of the timing (Talmor and Vasvari (2011)). Just like for fund investments, the PME compares an investment in a PE deal with an investment of the same timing and amounts in a public market index. GPs aim at an IRR of at least 20-25% and a MM of at least 2.0-2.5 times their investment for a typical transaction (Talmor and

[11] A caveat is that the sample was obtained from one LP only. See Lerner et al. (2007) for differences in skill and performance between LPs. For comparing the 18% net-of-fees outperformance over the fund lifetime, Harris et al. (2014a)'s 3% p.a. amount to 20% outperformance over the fund lifetime, also net of fees.

[12] Other terms used to describe the MM are total distributed value to paid-in capital (DVPI) and total value to paid-in capital (TPI). In more detail, they differ in whether unrealized values for portfolio companies that have not been sold are included or not.

Vasvari (2011)). Braun et al. (2016) find a median PME of 1.4 and MM of 1.9 for fully realized deals based on their sample of global deals from 1974-2012. For all deals, including unrealized and partially realized, they find a median PME of 1.3 and MM of 1.5. Lopez-de-Silanes et al. (2015) also find a median PME of 1.4 and a MM of 2.1 and IRR of 26% for fully realized deals in their sample from 1986-2005. For their full sample they find a median PME of 1.3, MM of 1.9 and IRR of 21%. The figures of Braun et al. (2016) and of Lopez-de-Silanes et al. (2015) are gross of fees. Furthermore, the results of Lopez-de-Silanes et al. (2015) show that IPOs as an exit channel perform best, followed by trade sales, i.e., sales to a strategic investor. Nikoskelainen and Wright (2007) confirm this preference of exit channels, while their sample of UK deals from 1995-2004 shows an average of 70% IRR, markedly above the results mentioned before.

Regarding the cyclicality of PE and its returns, Robinson and Sensoy (2011) find that public market and PE waves move together. Their results imply that high PE fundraising does not correspond to high returns at the same time, rather that high PE fundraising forecasts low PE cash flows and low market returns. This is intuitive and has been named ‘money chasing deals’ by Gompers and Lerner (2000), who show that higher inflows increase the prices paid for deals. On a time scale, Higson and Stucke (2012) find a downward trend in absolute returns over time. Chung et al. (2012) analyze the relation of fund performance on the ability to raise follow-on funds. Their results imply that the lifetime income of a GP is influenced by the ability to raise further funds and that the indirect pay from future funds is of the same order of magnitude as is the pay from the current fund through carried interest. Fund managers are aware that past performance influences their ability to raise follow-on funds, a mechanism that might lead to GPs taking more risk than deemed appropriate by LPs (Ljungqvist et al. (2008)).

Closely related to research about the performance of PE is the question of the persistence of these results. Most GPs are raising new funds in intervals of five years, in order to always have a pool of capital available for investments. LPs constantly need to decide which funds to invest in. One common method is to rank funds from a given vintage year (the year the funds were closed) by their performance and consider the GPs with funds in the top quartile for investments in their follow-on fund. However, as past performance may not predict future performance adequately, this method is unsafe to rely on. Kaplan and Schoar (2005) first analyzed how persistent performance of GPs is by comparing the likelihood that a GP's fund outperforms other funds if the previous fund has also outperformed. They find strong persistence in the top and flop quartiles as well as increasing performance with both fund size and GP experience. Harris et al. (2014b) analyze top-quartile investing of US funds and confirm performance persistence before the year 2000. After 2000, they do not find persistent performance anymore, only for flop funds. Braun et al. (2016) use a different approach, taking advantage of a sample of deal-level data that contains cash flows between the portfolio companies and the funds and is thus much more accurate. Based on 'synthetic funds' constructed from those actual deals, the authors confirm the results of Kaplan and Schoar (2005) until 2000. After that, persistence has disappeared owing to the ongoing maturity of the PE industry. Their results also show that persistence drops in relation to competition for deals, i.e., when competition is higher, persistence is lower. In another recent study, Korteweg and Sørensen (2014) analyze long-term persistence and find that skilled PE firms outperform. However, they conclude that LPs have difficulties finding those skilled firms.

When analyzing the performance of investments into PE, risk is a crucial factor. It includes questions about how to measure risk; questions about the extent of the risk and questions about whether and which part of risk is diversifiable for investors. The difficulty in measuring risk is

that PE investments are illiquid. On a deal level, there is no market price available during the holding period. On a fund level, the same problem exists, but for an even longer period of time, as funds are usually set up for ten years. Thus, risk measures differ strongly by how intermediate valuations are derived and by what measure for risk is used. Andrade and Kaplan (1998) value the cost of financial distress of leveraged buyouts. They focus on financial, not economic distress cost and ultimately value financial distress cost at 10-20% of total firm value. Groh et al. (2008) calculate the idiosyncratic risk of LBOs and use risk-adjusted returns[13] to measure risk. However, they do not find empirical results due to the limited sample available to them. Ewens et al. (2013) research in a similar direction and argue that the principal-agent conflict between GPs and LPs is the reason for LPs' returns to strongly depend on diversifiable risk. However, as they analyze VC transactions, which have a different risk profile on a fund level, findings cannot easily be transferred to PE investments. Franzoni et al. (2012) focus on liquidity risk and value the risk premium at 3% annually.

1.2.2 Value Creation

The key to understanding how returns are achieved in PE is understanding value creation, i.e., how the investors are able to increase the value of the portfolio company during the holding period. In a typical framework, the drivers available to GPs are leverage, i.e., the use of debt, operating improvements, i.e., measures to improve the operations of the portfolio company, and multiple expansion, i.e., selling the company for a higher multiple of earnings than it was bought for (Pindur (2007)). Analyzing a sample of European PE transactions, Achleitner et al. (2010) find that one-third of the value created results from the use of leverage, 45% from

[13] They use Sharpe-Ratios, where returns are adjusted by the standard deviation of those returns.

operating improvements[14] and close to 20% from multiple expansion, i.e., the change in transaction multiple from entry to exit. Acharya et al. (2013) present an important piece of research that finds abnormal performance in PE deals, compared with publicly listed peer companies from the same industry. The results show that abnormal performance is largely influenced by increases in sales and in operating margin during the holding period of the portfolio company. They also note leverage as an important driver of value creation. Other research finds governance structures as one of the main drivers of value creation, something that is difficult to measure. Here, the common feature used in most PE transactions is equity ownership by management (Nikoskelainen and Wright (2007), Leslie and Oyer (2013)). Lerner et al. (2011) use the patenting behavior of PE-owned firms as a proxy for how focused they are on long-term investments, supporting the notion that PE investors help portfolio companies by strengthening their focus on those activities that add most value.

Operating improvements are one of the key value creation drivers in PE transactions. Previous evidence shows that PE investors indeed influence operations of the portfolio companies, compared with the situation before the transaction (Kaplan (1989)) as well as compared with other non PE-owned firms (Guo et al. (2011)). The influence of operating improvements on value creation is estimated at almost half of total value creation (Achleitner et al. (2010)). Main drivers for operating improvements are working capital management[15] (Smith (1990)), and increases in sales and thus EBITDA (Acharya et al. (2013)).

[14] Measured by the growth in earnings before interest, tax, depreciation and amortization (EBITDA) and Free Cash Flow created.

[15] Working capital management is the active management of current assets and current liabilities of a company.

Multiple expansion as another one of the drivers of value creation is influenced by deal pricing – at entry as well as at exit (Achleitner et al. (2011)). Previous results on the importance of pricing and its determinants show that leverage increases deal prices (Axelson et al. (2013)). The results of Bargeron et al. (2008) show that PE buyers pay markedly less for their deals than public acquirers. This premium paid by public acquirers increases with increasing ownership by management of the portfolio company. The authors attribute this to higher cooperation with existing management in PE transactions than in acquisitions by public buyers. The more shares management owns, the bigger their influence on pricing and on the ultimate buyer. For a sample of buyouts from 1990-2006, Guo et al. (2011) find that prices and leverage are lower than those of deals from the 1980s, supporting the results of Kaplan and Strömberg (2009), who find strong movements of EV/EBITDA over time.

Closely related to questions of deal pricing is deal leverage, i.e., the use of debt to finance transactions and the factors determining the amount of debt used. In their analysis on deal pricing, Kaplan and Stein (1993) show the "overheating" of the market during the 1980s, which came with higher leverage levels. Although the results do not show causality, the authors attribute this development to a "demand push from the junk bonds market" from the mid-1980s on. Axelson et al. (2013) find that leverage is associated with economy-wide credit conditions and that the cost of debt drives the use of debt. Further, they find that higher leverage is associated with lower returns, i.e., buyers tend to 'overleverage' their transactions. Engel et al. (2012) find similar results, namely a positive relationship between debt and returns, and, similarly, there is a point at which 'overleverage' takes place and deal returns are lower for higher leverage levels. For a sample of public-to-private LBOs, Demiroglu and James (2010) find that GP reputation is positively related to leverage in deals and leverage in turn is positively related to deal prices.

1.2.3 Skill and Luck

Building on the research on PE performance is the question whether this is the result of explicit skills by the GPs rather than just luck in selecting the right investments or timing the entry and exit well. Kaplan and Schoar (2005) already argue that the performance persistence they find is a skill acquired by GPs over time. Korteweg and Sørensen (2014) attribute the persistence in performance they do find to skills inherent in the top performing PE firms. However, they note that owing to the noise in the performance, i.e., variation they cannot explain, LPs have difficulties in identifying those skilled GPs. Based on the significance of multiple expansion for value creation, Achleitner et al. (2011) attribute it to pricing skills of the GPs rather than luck. They argue that over the course of time GPs accumulate the skills necessary to pay lower prices in acquisitions, which then results in higher multiple expansion during the holding period.

1.2.4 Specialization and Diversification

An important decision for a PE firm is whether to specialize or to operate diversified in terms of region[16], industry or transaction size for the deals in which to invest. Evidence shows that larger funds have a broader global scope and more diversification across industries over time (Strömberg (2008), Kaplan and Strömberg (2009)). For funds based in the US and Europe, results by Lossen (2006) show that a broader industrial scope of a fund results in higher fund-level IRR. However, the results do not show an influence of regional diversification. Industry focus has shifted from traditional industries that were in the focus for buyouts towards sectors that are strongly growing and are more ‘high-tech’. Harrigan et al. (2010) find a positive

[16] I.e., countries, continents.

relationship between diversification and performance, which supports the hypothesis that a broader scope allows for an increase in profitable deals. However, there seems to be a 'sweet spot' of diversification, a point after which further diversifications leads to diminishing returns again, due to a lack in focus and expertise on the investments by the GPs' investment team. Humphery-Jenner (2013) finds that diversification by geography and by industry increases fund returns through knowledge sharing and learning. However, diversification can also reduce returns, namely when it is done to reduce the risks of the fund or if there are not enough investment professionals in relation to the number of investments. When arguing on the advantages and disadvantages of specialization and diversification, recent research reveals intuitive results: for a sample of VC transactions, Gompers et al. (2009) find that investment managers should specialize in order to improve deal performance, whereas a fund should be diversified concerning its expertise in order to improve deal performance.

1.2.5 Industry Maturity

A growing stream of PE research deals with questions of maturity of the PE industry. As the asset class is young in comparison to, e.g., shares or bonds, maturing in different ways should be expected. Based on increasing competition, a commoditization of the industry, more participants, higher capital inflows and decreasing GP rents, Sensoy et al. (2014) argue for an increasingly mature PE industry. Lerner et al. (2007) characterize this ongoing maturity through differing returns from PE by investor type, where endowments are able to generate the highest returns from their fund investments. The authors argue that endowments are better in predicting whether follow-on funds are also successful and find that funds selected by banks surprise with poor performance. Strong signs for an ongoing maturing of the PE industry are the development and dissemination of other types of investments. Minorities, where a GP invests only in a minority stake, are an up-and-coming phenomenon not yet widely researched (Kaplan and

Strömberg (2009)). Topics researched in this respect are how to exert influence while not owning a factual majority (Söding (2012)) and the performance of those investments compared to classical majority deals (Battistin et al. (2013)). The transfer of the results from minority investments by family firms (Tappeiner et al. (2012)) or corporate investors (Liao (2014)) to a setting where a PE investor owns a minority of a private firm has yet to be done (Chen et al. (2014)). Increasingly demanded from investors are co-investments, where LPs directly invest into companies selected by the GPs whose funds they have invested in, parallel to those funds (McCahery and Vermeulen (2013) and Dineen (2012)). First academic evidence finds that co-investments underperform the funds with which they co-invest, and attributes this to the adverse selection of co-investments offered to LPs by the GPs (Fang et al. (2015)). However, this remains to be further confirmed. Club deals, where more than one GP invests in the same portfolio company, are increasingly appearing. One key research question is the influence on competition and pricing, as clubs formed by GPs reduce the number of bidders for a deal (Marquez and Singh (2013), Boone and Mulherin (2011), Officer et al. (2010)). Secondary buyouts, i.e., transactions where a portfolio company is sold by one GP to another GP, are yet another investment type gaining in importance and thus supporting the maturing of the PE industry (Kaplan and Strömberg (2009), Achleitner et al. (2012)). Previous results show that secondary PE investments do not perform worse than primary deals and thus present an investment type that can be expected to stay and even gain in appearance (Achleitner and Figge (2014)).

1.3 Structure of the Thesis and Main Findings

Following this introduction, the main section presents three essays, each of which represents a distinct research paper that makes independent academic contributions of its own (sections 2.1 to 2.3). The first essay provides an overview of value creation and its constituents. The second essay analyzes the influence of relative deal pricing on returns. The third essay focuses on the differences in value creation between minority and majority PE investments.

This dissertation uses similar data for all essays in the main section. The initial sample consists of individual transactions obtained from three large institutional investors. It contains an anonymous database of 13,095 unique investments, which the institutional investors provided. The database contains data about the transactions as well as details about fund size, vintage year and fund generation. For a subsample of this dataset, the investors have collected so-called value-creation data. This comprises information at entry and at exit of the transaction, namely, sales, EBITDA, and EV with its equity and debt portions. The samples used in the essays are based on this subsample of deals that contain value-creation data. Essay 1 uses a subsample of all realized and partially realized deals with complete value-creation information at entry and at exit, i.e., EV, equity, debt, sales, and EBITDA. The final sample for the essay comprises 2,029 transactions. Essay 2 uses a subsample of all realized deals where entry and exit EV/EBITDA multiples are available. The final sample for essay 2 comprises 2,174 transactions. Essay 3 uses a hand-picked subsample of those realized transactions with full value-creation information where minority and majority investments could clearly be differentiated. The final sample for essay 3 comprises 920 transactions, 96 of which are minority and 824 of which are majority investments.

Essay 1, "International Evidence on Value Creation in Private Equity Transactions", addresses the question of how value creation in PE transactions differs. It analyzes value creation along four drivers. Those are EV/EBITDA multiple expansion, EBITDA growth and FCF effect, i.e., debt paydowns over the holding period. EBITDA growth is separated into an effect from sales growth and into an effect from changes in EBITDA/sales margin. Further, the transactions are adjusted for the risk inherent in their financing structure, separated in the leverage effect. These drivers are analyzed across four different dimensions. They are compared for different regions, namely North America, Europe and Asia and for different industries, separated into four categories. Further, value creation is compared for small-, mid- and large-cap transactions, based on transaction value at entry. Finally, the development of value creation and its drivers over time, for transactions entered between 1987 and 2013, is analyzed.

The essay shows that over the 25 year-period analyzed, the average value creation on a company level was 3.4x invested capital, 31% of which were the result of financial leverage and 48% stemmed from operating improvements. The most prominent driver of value creation was EBITDA growth during the holding period, which accounted for 37% of total value created. By regions, North American deals displayed the highest value creation, follow by European and Asian deals. North American deals' main driver was leverage whereas Asian deals showed strong influence of sales growth. Analyzing different industries, the essays shows that transactions in the area of technology gained most from transaction price growth and less from operating improvements than deals in other industries. Transaction size proved to be an important factor, with small-cap transactions consistently delivering higher value creation than mid- and large-cap deals. Here, especially transaction multiple growth was a strong factor, likely stemming from portfolio companies' growth into higher multiple classes. Most remarkable was the extent to which value creation has declined over time. Total value creation

has dropped by over one-third from before 2000 until after 2008, showing strong evidence that the industry may indeed continue to mature. This essay contributes to the existing literature in that it presents a novel dataset that allows for very detailed analysis of value creation in private equity. It provides novel evidence on how value creation differs by market segments and – most importantly – how it has developed over time. It thus shows strong evidence for the ongoing maturity of the PE industry.

Essay 2, "Deal Pricing in Private Equity", focuses on a select driver of value creation, namely EV/EBITDA pricing and its influence on deal returns. By comparing actual transaction pricing to the prices paid in other PE deals from the same market segment during a similar time, the influence of relative pricing on multiple expansion can be separated. As GPs negotiate in order to set deal pricing, this relative pricing gives an indication of the influence of GP skills on deal returns. Transaction pricing is compared with a relevant market segment which is defined based on region, industry, transaction size and time, in order to provide meaningful comparisons.

The essay shows that multiple expansion is an important factor in explaining deal returns. It shows that market price levels at the time of entry and exit strongly influence the multiple expansion that is achieved in PE transactions. Further, being able to buy deals below and sell them above market prices positively influences multiple expansion. As multiple expansion is a key driver of deal returns, similar effects can be seen for returns, measured by IRR. In more detail, selling high at transaction entry has about twice the influence that buying low at deal entry has. Exit pricing thus has a higher influence on multiple expansion and returns than entry pricing. The essay attributes a skillset to GPs: as agreeing on a price requires a negotiation, the outcome is something influenced by the GP. This essay contributes to existing research by detailing the pricing mechanisms and its consequences on deal returns. It shows that, unlike

usually expected, achieving a higher selling price influences returns more than buying a company cheaply. Additionally, it provides further evidence for the existence of a GP skillset that helps make good investments. Investors in PE need to find GPs who are able to use their skillset in pricing negotiations in order to achieve sufficient returns.

Essay 3, "Private Equity Minority Investments", provides insights about returns and value creation in PE minority transactions. The essay compares minority to classical majority investments and analyzes whether and to which extent returns differ in minority compared to majority investments, as the influence the GP can take is limited. A common framework for assessing value creation is used and broken down into its constituents. Further, risk-adjusted returns between the two types of PE investments are compared in order to assess whether differences in returns come along with differences in risk.

The essay shows that the returns of minority investments are below those of majority investments. This is also shown for the individual value creation drivers, which are the leverage effect, EV/EBITDA multiple expansion, FCF and EBITDA effect. However, it is shown that the risk-adjusted returns of minority investments are above those of majority investments. Minorities thus show a different risk-return pattern within the PE industry and offer a means for diversification on both deal and fund level. This essay contributes to the existing literature by shedding light on PE minority investments, an emerging type of investment that has not been researched extensively up to this point. It provides an initial understanding of the mechanisms that differ compared to majority investments and possible reasons for minorities potentially becoming an interesting and alternative form of investment within the PE industry.

Chapter 3 summarizes the findings and develops practical implications. It concludes with an outlook for potential future topics for research in the area of private equity.

2 Essays

2.1 Essay 1: International Evidence on Value Creation in Private Equity Transactions

Abstract

Understanding value creation at the transaction level is at the heart of explaining private equity (PE) returns. Taking advantage of a proprietary sample of 2,029 international buyout deals executed between 1984 and 2013 we provide detailed evidence on financial, market and operational value creation drivers. Additionally, we unravel the differences in value creation between regions, industries, transaction sizes and over time, providing limited and general partners with the opportunity to compare their past transactions with those of their respective peer groups.

Keywords: Private Equity, Value Creation, Leveraged Buyouts

JEL Classification Code: G23, G24, G31, G32, G34

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2.1.1 Introduction

Private equity (PE) has become a major focus of financial research since the late 1980s.[17] One of the main outputs of such research is a large body of evidence on the performance of PE funds. But to understand the performance of such funds and the returns they have provided their limited partners, one must understand how value is created in the individual portfolio companies acquired by the funds. And since Steven Kaplan's study of the first wave of large ($100 million or greater) U.S. LBOs in the late 1980s, there have been remarkably few studies of the value created by individual transactions and portfolio companies. What studies of this kind focus mainly on are specific segments of the leveraged buyout (LBO) market, such as particular geographic regions (such as the U.S. or North America) or transaction sizes.[18] In addition, we also know little about the effects of the financial crisis on the performance of PE portfolio companies. Both of these gaps in the research can be attributed to the scarcity of data and the resulting limited sample sizes available for research.[19]

In this article, we present the methods and findings of our recent analysis of value creation in a sample of over 2,000 LBOs that includes deals of all sizes that were transacted in 45 different countries on six continents. For each of these transactions, we provide estimates of the value created, the split of this value creation into various financial, market, and operational effects, and the relative contribution of these effects to the total value created. Our analysis also

[17] See Axelson et al. (2013), Guo et al. (2011), Lerner (2011), and Kaplan and Schoar (2005).

[18] See Braun et al. (2016) and Kaplan and Schoar (2005) for evidence on fund performance and Acharya et al. (2013), Achleitner et al. (2011), Guo et al. (2011), Achleitner et al. (2010), Nikoskelainen and Wright (2007) or Kaplan (1989) for deal-level evidence on value creation.

[19] See Harris et al. (2012) on the difficulty of collecting data.

takes into account differences between regions, industries, transaction sizes, and, most importantly, periods of time.

In so doing, we use a simple methodology to model value creation that is commonly used among general partners (GPs) and limited partners (LPs) in the industry. Our proprietary sample of 2,029 private equity investments executed between 1984 and 2013 includes complete data on key financial information both at the time of the acquisition by the private equity firm (entry) and at the sale of the company (exit). The sample also includes monthly gross cash flows to the private equity firms before carried interest and fees, which enables us to compute precise gross returns for each investment and to capture additional capital injections as well as dividend payments during the holding period.

What's more, we use a widely accepted methodology that divides the total value created as a percentage of total capital invested into the following four components: (1) the contribution from leverage (or "financial risk"); (2) increases in operating cash flow (as measured by increases in EBITDA); (3) growth in the transaction multiple; and (4) a Free Cash Flow (FCF) effect that is estimated by the reduction in net debt over the holding period. EBITDA is further split into sales and margin contribution. For each of these four sources of value creation, we calculate both absolute numbers (again, in terms of either a percentage or multiple of invested capital) and their relative contribution to total value created.

With the help of this unique large-scale data set with such detailed information, we were able to gain insights into the value creation of buyout transactions after sorting them in four different ways: (1) by region of the investment; (2) by industry; (3) by transaction size; and (4) by year of exit. Analyzing the sample across these market segments gives us a more detailed understanding of the underlying drivers of value creation. The regional view allows exploration

of whether the differently developed PE markets in North America, Europe, and Asia display different levels and sources of value creation in the transactions. The target company's industry also has the potential to affect value creation since the prevalent business models and the nature of the assets—say, for securing debt—can differ considerably among different industries. And because it seems intuitive that the mechanisms underlying value creation in deals of varying size are not necessarily the same, we also differentiate between small-, mid-, and large-cap transactions.[20] Finally, we compared transactions from before and after the global financial crisis. By so doing so, we are able to provide new insights into the ongoing debate about the extent to which this extreme event has shaped the PE industry.

While providing valuable insights on value creation patterns in these different segments of the private equity markets, we also aim to provide LPs and GPs analyzing portfolios with comparisons for value creation in LBOs. Whether used for internal monitoring purposes or in marketing materials supporting fund-raising activities, our average value creation statistics give these financial institutions a wealth of possible comparisons.

Our analyses revealed that value creation varied in absolute as well as in relative terms. First of all, we found big differences between regions, with transactions in North America delivering the highest absolute value creation in terms of returns on invested equity capital, and Europe and Asia trailing at about the same level. The higher returns were attributable mainly to the greater use of leverage in North American transactions. Operational improvements were equally important in absolute terms, with Asian deals in particular benefiting from higher sales growth. Owing to the differences in total value created, however, these improvements

[20] Indeed, previous studies have shown that both transaction and company size matter in the context of value creation. See, e.g., Achleitner et al. (2010).

contributed a higher relative share in European and Asian transactions than in North American deals. Comparison of the transactions across industries revealed differences in absolute value creation, with the highest returns in deals involving industrials and consumer services, and the lowest involving technology companies. Part of the higher returns to industrial company deals was due to their more aggressive use of leverage. By contrast, the gains in value in transactions involving technology companies were attributable more to growth in transaction multiples than to increases in revenue or operating cash flow during the holding period of the investment. But differences in transaction size played an even more important role than regional or industry differences in explaining levels of value creation. Smaller deals exhibited higher absolute value creation than mid-cap transactions, which in turn exhibited higher value creation than large-cap deals. Large-cap transactions relied slightly more than smaller deals on leverage, whereas small-cap deals benefited much more than large transactions from growth in multiples. Small-cap deals saw a higher level of operating improvements, stemming from higher sales growth over the investment period.

Nevertheless, our analysis showed exit year to be the most important factor in value creation. It is perhaps not surprising given anecdotal evidence that value creation dropped over the decades considered, but both the extent and consistency of the decline are remarkable. The transactions exited between 2001 and 2008 delivered an almost one-third higher value creation than those exited after 2008. Leverage has played less of a role in the returns of the post-2008 deals than in the past, as have multiple expansion, the FCF effect, and operating improvements. But because the absolute decline in operating improvements was smaller than the decline in total value creation, its relative importance has increased over time. Of all the effects measured, only the contribution of EBITDA growth to total value has remained fairly constant.

2.1.2 Methodology

We define value creation as the net capital gain to investors in the company. This includes the change in the value of the equity between entry and exit, as well as dividends received minus additional equity injected during the holding period. To allow for comparison of the value creation among deals of different sizes, we express the net capital gain as a multiple of the total amount of invested capital, which includes equity invested at entry plus any equity injected during the holding period. We follow common industry practice in referring to this widely used measure of value creation as the "Times Money" (TM) received by *all* equity investors. TM differs from the classic PE performance measure called "Money Multiple" (MM) in that the latter usually reflects a multiple of the returns on the invested capital by the general partner, or GP, which does not necessarily hold a 100% equity ownership in the target company.[21] We also avoided use of performance measures related to market development, such as Public Market Equivalent (PME). This approach would blur the view of the absolute value created over the holding period as these measures involve comparisons of PE investor returns with those earned by public market investors.

Our methodology was based on previous research for detailing value creation using the following components.[22] First, the TM of each transaction is "unlevered" to separate the financial risk created by the share of debt in the total transaction value, which allows us to compare different transactions regardless of their original level of financial risk.[23] Next, the

[21] Achleitner et al. (2010) express the MM for their sample on the basis of 100% ownership.

[22] See Acharya et al. (2013), Achleitner et al. (2010), and Pindur (2007) for the methodological foundations.

[23] We use the following formula for unlevering each of the transactions: $TM_u = \frac{TM_l + r_D\left(\frac{D}{E}\right)}{1+\frac{D}{E}}$. TM_u represents the unlevered Times Money for the transaction as if financed entirely by equity, and TM_l represents the levered Times Money with the capital structure of the individual transaction as it is. $\frac{D}{E}$ represents the average debt-to-equity ratio,

remaining value creation is divided into further value creation drivers that represent changes in the transaction multiple, EBITDA, and FCF over the holding period. What we refer to as the "multiple effect" is the value attributable to the increase in the EV/EBITDA multiple from transaction entry to exit; it is calculated by multiplying the change in the multiple over the holding period by the EBITDA at entry.

The FCF effect captures the value created from the free cash flow that is used to repay debt or pay dividends to shareholders. But it also reflects the effects of equity capital injections over the holding period. The FCF effect is obtained by computing the reduction in net debt over the holding period plus interim dividends and minus interim capital injections. The EBITDA effect reflects operating improvements that result in a change in EBITDA between entry and exit, and is calculated by multiplying the change in EBITDA during the holding period by the EV/EBITDA multiple at entry. In the rest of the article, we refer to the sum of FCF and EBITDA effect as operating improvements, since we view increases in EBITDA and the related ability to increase FCF as reflecting the success of portfolio companies in increasing the efficiency of their operations. Increases in transaction multiples, by contrast, are treated primarily as the result of changes in market-wide conditions, though it could also reflect either an increase in the companies' growth prospects that are not reflected in current operating cash flows or the GPs' ability to find value-adding strategic or financial buyers.[24] And because of our inability to distinguish between these two sources of value added, we calculate and report a "combination

and r_D the total cost of debt during the holding period. We use an individual interest rate per transaction, which is based on the monthly LIBOR at entry and a median spread of sponsored loans of 300 basis points as reported by Ivashina and Kovner (2011).

[24] We are not taking a stance on whether transaction-multiple expansion is a result of skill rather than luck. See Achleitner et al. (2011), for this discussion.

effect" that is intended to capture simultaneous changes in EBITDA and the EV/EBITDA transaction multiple from entry to exit. [25]

The EBITDA effect is then separated further into value creation drivers that represent increases in sales and in EBITDA margins. The sales effect is meant to reflect the value created by increases in portfolio company revenues, and is calculated by multiplying the change in sales first by the margin and then by the EV/EBITDA multiple at entry. The margin effect represents value created from increases in EBITDA margin and is calculated by multiplying the change in margin by the sales and by the EV/EBITDA multiple at entry. And in this case, we calculate another combination effect—one that captures simultaneous changes in sales and EBITDA margin from entry to exit.

We applied this methodology to each transaction in our sample. Then, we computed averages for groups of LBOs across the dimensions analyzed—for example, for all portfolio companies with headquarters in Europe.

2.1.3 A Sample Calculation

To illustrate our methodology, we now provide a simple example that shows the calculation of these value creation drivers for a hypothetical transaction. As reported in Panel A of Table 2-1, the total enterprise value (EV) at entry is assumed to be $100 million, and to be financed with 50% equity and 50% debt. Given an EBITDA at entry of $10 million as a base for valuation, the GP is thus assumed to have paid a 10x EBITDA multiple to close the deal. During the four-year holding period that follows, the company is assumed to pay out $20

[25] Thus, both EV/EBITDA multiple and EBITDA effect are taking a ceteris paribus view on changes in the respective measures *as if* the other measure did not change during the holding period. The combination effect then captures the remainder.

million in dividends while receiving an infusion of another $15 million of equity. The interest rate is assumed to be 9.0% p.a.—that is, LIBOR in the month of the transaction is 6.0% plus a spread of 300 basis points. And after four years, the company is assumed to be sold for $165 million. By this time, $20 million of the $50 million of the debt is assumed to have been repaid, leaving the company with $30 million of debt on its balance sheet.[26] The average D/E ratio during the holding period is 0.61 ((50/50+30/135)/2=0.61).

[26] Based on the holding period and the interest rate, the total cost of debt for the transaction is 41.2% (1.09^4 – 1=0.412) of the initial investment.

Table 2-1: Value Creation Bridge Calculation for Example Calculation

This table presents assumptions and calculation of value creation effects for a fictional transaction. Panel A shows the assumptions for deal structure and company profile at entry and exit of the transaction and the relevant figures during the holding period of the company. Panel B shows levered and unlevered TM and the relating calculation. Panel C shows absolute and relative value creation produced by our methodology. Percentages are given on basis of levered TM. TM points are obtained by multiplying these percentages with levered TM.

Panel A: Case Assumptions

No.	Position	Entry [USD m]	During holding period	Exit [USD m]	Calculation
(01)	Enterprise Value	100		165	
(02)	Equity	50		135	
(03)	Debt	50		30	
(04)	Sales	100		120	
(05)	EBITDA	10		15	
(06)	EBITDA/Sales	10.0%		12.5%	
(07)	EV/EBITDA	10x		11x	
(08)	Debt/Equity	1.00	0.61	0.22	
(09)	Dividends [USD m]		20		
(10)	Capital injections [USD m]		-15		
(11)	Interest rate		9%		
(12)	Holding period [years]		4.0		
(13)	Cost of debt		41.2%		(1+(11))^(12)-1

Panel B: Levered and Unlevered Times Money

		USD m	TM points	% of TM	
(14)	Delta Equity	85.0			(02) at exit - (02) at entry
(15)	Net capital gain	90.0			(14)+(09)+(10)
(16)	Equity at entry	50.0			
(17)	Invested capital	65.0			(02)+(10)
(18)	**Times Money**		**1.38**	**100%**	(15)/(17)
(19)	**Leverage effect**		**0.37**	**27%**	(18) - (20)
(20)	**TM unlevered**		**1.02**	**73%**	[(18)+(13)*(08)]/[1+(08)]

Panel C: Absolute and Relative Contribution of Value Creation Drivers

(21)	Delta Multiple	1x			(07) at exit - (07) at entry
(22)	EBITDA at entry	10			(05) at entry
(23)	**Multiple effect**	**10.0**	**0.11**	**8%**	(21)*(22)
(24)	**Combination effect**	**5.0**	**0.06**	**4%**	(21)*(27)
(25)	Delta debt	20.0			(03) at entry - (03) at exit
(26)	**FCF effect**	**25.0**	**0.28**	**20%**	(25) + (09) + (10)
(27)	Delta EBITDA	5			(05) at exit - (05) at entry
(28)	EV/EBITDA at entry	10x			(07) at entry
(29)	**EBITDA effect**	**50.0**	**0.56**	**41%**	(27)*(28)
	Total (TM unlevered)	**90.0**	**1.02**	**73%**	
(30)	Delta Sales	20.0			(04) at exit - (04) at entry
(31)	Margin at entry	10%			(06) at entry
(32)	EV/EBITDA at entry	10.0			(07) at entry
(33)	**Sales effect**	**20.0**	**0.23**	**16%**	(30)*(31)*(32)
(34)	Delta margin	2.5%			(06) at exit - (06) at entry
(35)	Sales at entry	100.0			(04) at entry
(36)	EV/EBITDA at entry	10.0			(07) at entry
(37)	**Margin effect**	**25.0**	**0.28**	**20%**	(34)*(35)*(36)
(38)	**Combination S/M effect**	**5.0**	**0.06**	**4%**	(30)*(34)*(36)

How do we estimate the value created by this transaction? As can be seen in Panels B and C of Table 2-1, the transaction is viewed as delivering a net capital gain of $90 million (the $85 million increase in equity value, plus the $20 million in dividends and minus the $15 million of capital injections) on the invested capital of $65 million. Thus, the total TM is 1.38 (90/65) times the invested capital.

This TM is then "unlevered" (adjusted downward for the effect of debt financing as described in the methodology section, which produces an unlevered TM of 1.02x ((1.38+41.2%*0.61)/(1+0.61)=1.02). The leverage effect in this transaction is thus 0.37x, which reflects the difference between levered and unlevered TM.

Further, in Panel C we show the result of dividing this total value creation into the separate effects described earlier. The transaction-multiple effect reflects any change, as mentioned earlier, in market conditions or in the perceived growth prospects for the company or industry that have taken placed during the holding period; and in our example, the multiple is assumed to increase from 10 to 11 times, resulting in a multiple effect of $10 million (11x – 10x) x starting EBITDA of $10 million).

Because the effects of changes in the transaction-multiple and EBITDA are based on the corresponding entry base, there is also a "combination effect" that results from the simultaneous change of both factors that we calculated to be $5 million ($15 million – $10 million) x (11x – 10x)). The FCF effect, which again represents debt repayment plus interim capital flows between shareholders and the company is $25 million ($50 million – $30 million) + ($20 million – $15 million). The EBITDA effect is $50 million (($15 million – $10 million) x 10x). These single value creation drivers add up to an increase in total value of $90 million ($50 million + $10 million + $25 million + $5 million).

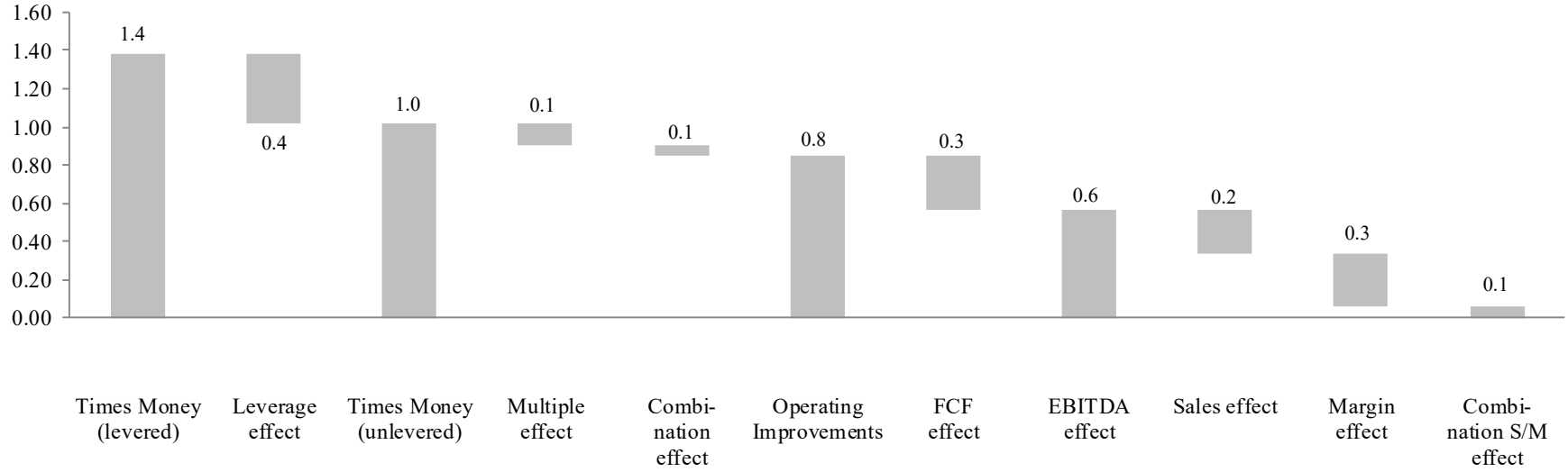
Then, we also further divide the EBITDA into two categories: effects on margins and combination effects. The sales effect in the example is $20 million ($120 million – $100 million) x 10% (sales margin) x 10 (multiple). The margin effect is $25 million ((12.5% - 10%) x $100 million) x 10x)). And the combination effect of the increases in both sales and margin is $5 million (($120 million – $100 million) x (12.5% - 10%) x 10x).

In the next part of our analysis, we calculate the percentage contributions of each of these value creation drivers to the total unlevered TM. For example, in the case of the EBITDA effect, we divide the estimated EBITDA effect of $50 million by the total value increase of $90 million, which we then "unlever" by multiplying by .73 to get .41, or 41%.

These results show that, in this simple hypothetical case, the largest part of value creation results from operating improvements, which yield a substantial EBITDA effect and a reduction of net debt (FCF effect). Figure 2-1 shows the split of the individual components of value creation in Times Money points for the example calculation.

Figure 2-1: Value Creation Bridge for Example Calculation

This figure shows the value creation bridge for the example calculation based on a fictional transaction.



2.1.4 Data

Our initial sample consisted of 13,095 unique private equity investments that we obtained from three large institutional investors who serve as LPs in private equity funds. These institutional investors obtained information about the deals in the course of their search and due diligence on potential funds to invest in. As part of their fundraising efforts, GPs provide the LPs they are approaching with a detailed track record of all their past investments. We expect to see the maximum of information available to outsiders since the LPs should be the ones closest to their GPs. The LPs provided this information without disclosing either their own names or the names of individual transactions to us.

The data contains fund-level information such as fund size, fund vintage, and fund generation and deal-level information such as the industry and country of each investment. But most important, we were able to observe the monthly operating cash flows for each portfolio company before any allocations to the GP for carried interest and management. This enabled us to calculate the full value created—that is, before any compensation for the GP, which would limit the comparability of transactions—in terms of Times Money, thereby fully accounting for interim dividends and capital injections. (In Panel A of Table 2-2, we provide summary information about our entire overall sample of buyout transactions.)

To obtain the final sample for our analysis of value creation, we then excluded all transactions with "implausible" information, such as negative values for EV, equity, debt, or EBITDA values at entry or exit and also required enough information about the cash flows that enabled us to differentiate between additional injections and dividend payouts.[27] To further

[27] This requirement is necessary in order to receive meaningful results from our methodology.

ensure comparability, we calculated all values in U.S. dollars using historical, then current, exchange rates.

Our final sample consisted of a subset of 2,029 of these 13,095 deals for which we were also able to retrieve the information necessary to apply our value creation methodology—in other words, all the deals for which we could calculate EV, debt, equity, sales, and EBITDA at both entry and exit (debt and equity at entry are calculated after the recapitalization that takes places during the buyout).[28] Moreover, this sample contains both "fully realized" exits—that is, sales of 100% of the assets by the PE firm—and "partial" exits—those in which the portfolio company made some return of capital to the LPs, and in which there was a reliable basis for estimating the current market value of the remaining assets.[29]

As can be seen in Panel B of Table 2-2, about one third of the portfolio companies in our value creation sample were located in the U.S. or Canada (North America). The vast majority of the transactions, however, involved companies based in Europe, including those in the U.K. and continental Europe as well as Russia, Israel, and Turkey. Our final sample also included buyout transactions from China and Southeast Asian countries, as well as the Arabian Peninsula, Australia, South America, and Africa.

[28] Our sample contains the sample of Achleitner et al. (2010), but is prolonged to older and more recent deals (1991-2008 vs. 1987-2013) and enriched with more transactions enabling the additional splits by regions and industries.

[29] Partially realized deals in our definition have delivered at least some proceeds to the GP.

We excluded unrealized deals as net asset values are unreliable estimates of final returns, see also Jenkinson et al. (2013) and Phalippou and Gottschalg (2009).

As reported in Panel C of Table 2-2, the most common industries in our final sample were the following four: industrials (ICB Code 2000), consumer goods (3000), consumer services (5000), and technology (9000).

Panel D of Table 2-2 shows the breakdown of our sample by the size of the transactions, measured as the EV (total debt plus equity) at deal entry. "Small-cap" deals are those with an EV of up to $100 million, "mid-cap" deals have EVs between $100 million and $1 billion, and large-cap deals are those with EVs in excess of $1 billion.

Finally, Panel E of Table 2-2 shows the distribution of our final sample of deals according to the time of exit.[30] We assigned each deal to one of three time categories. The first includes all deals exited by 2000, the year the dot-com bubble burst. The second group included all transactions exited between 2001 and 2008—that is, deals exited before the most recent financial crisis. The third group includes all buyouts realized after the crisis in 2008. The descriptive statistics reported for each these time categories support the widely held view in private equity that increasing deal sizes over time have to a reduction in deal returns, at least in terms of MM and IRR.

[30] Entry of the first deal was in 1984 and exit of the last deal in 2013.

Table 2-2: Sample Descriptives

This table shows sample descriptives for the overall sample as well as for the final sample used for our value creation analyses by categories. The figures shown include median gross PME, IRR, MM, investment year and holding period by realization status, regions, industries, transaction size and exit year.[31]

		Median						
Panel A: Deal Status	**Obs.**	**PME**	**IRR**	**MM**	**Entry year**	**Holding period [yrs]**	**EV [USD m]**	**Thereof final sample**
Realized	8,126	1.4	21%	1.9	1998	4.4	64	1,448
Partially realized	2,916	1.4	15%	1.6	2005	3.8	103	581
Unrealized	2,053	1.0	0%	1.0	2006	2.2	115	-
All deals	**13,095**	**1.3**	**15%**	**1.6**	**2000**	**3.9**	**78**	**2,029**
Final sample	**2,029**	**2.0**	**34%**	**2.6**	**2002**	**4.5**	**98**	
Panel B: Regions								
North America	587	2.2	32%	2.8	2001	4.8	114	
Europe	1,336	2.0	35%	2.5	2002	4.3	89	
Asia	88	2.1	36%	2.5	2004	3.5	158	
Other	18	2.0	34%	2.7	2001	5.8	39	
Panel C: Industries								
Industrials	726	2.2	37%	2.8	2001	4.5	85	
Consumer Goods	467	1.9	32%	2.5	2002	4.6	96	
Consumer Service	327	1.9	34%	2.5	2003	4.5	120	
Technology	161	2.0	35%	2.7	2003	4.3	182	
Other	348	2.1	31%	2.6	2003	4.3	91	
Panel D: Transaction Size								
Small-cap	1,023	2.1	36%	2.8	2001	4.5	39	
Mid-cap	833	2.0	33%	2.6	2003	4.4	233	
Large-cap	173	2.0	29%	2.3	2005	4.3	2,086	
Panel E: Exit Year								
1987-2000	274	2.0	51%	3.2	1994	3.4	47	
2001-2008	1,111	2.1	36%	2.7	2001	4.2	87	
2009-2013	644	2.0	25%	2.4	2006	5.2	164	

[31] PME calculation is based on comparison with the regional MSCI index of each transaction.

For our entire initial sample of 13,095 deals, we found a median gross PME[32] of 1.3 and an IRR of 15%—and the conventional measure, MM, was 1.6. In the case of realized deals only, the returns were somewhat higher—1.4, 21% and 1.9—numbers that are slightly below those reported in a recent widely cited study of international PE deals by Lopez-de-Silanes et al. (2015) that found a PME of 1.4, an IRR of 26%, and a MM of 2.1.[33]

As for our final sample—which again includes partly as well as full realized deals—that we used when analyzing individual transactions, we found a median gross PME of 2.0, an IRR of 34%, and a MM of 2.6—which are considerably higher than the findings of the same widely cited study, which for realized deals, reported a PME of 1.4, an IRR of 26%, and a MM of 2.1; and for partly realized deals, reported a PME of 1.7, the same IRR of 26%, and a MM of 2.4. Thus, although our total sample is in line with previous findings, our final sample of deals with full value creation information has returns that are roughly one third higher in terms of PME and IRR and MM than those reported by the Lopez-de-Silanes et al. study.

These high deal returns for our final sample suggest a positive selection bias, one that is likely to stem from GPs' incentive and ability to exclude less successful transactions from the historic portfolios for which they provide value creation information to LPs during fund due diligence. In addition, because the main goal of our analyses is to compare the performance of companies in different regions and industries, whatever selection bias is present in the entire sample is likely to affect all groups in much the same way, thereby preserving the usefulness

[32] The PME measures the return of a PE transaction compared to the return that an investment of similar size and timing in a public index (here: regional MSCI index) would have produced. See Kaplan and Schoar (2005).

[33] See Lopez-de-Silanes et al. (2015).

of our comparison. Nevertheless, the reader of this study needs to keep in mind the strong possibility that our findings reflect the performance of LBOs that are well above average.

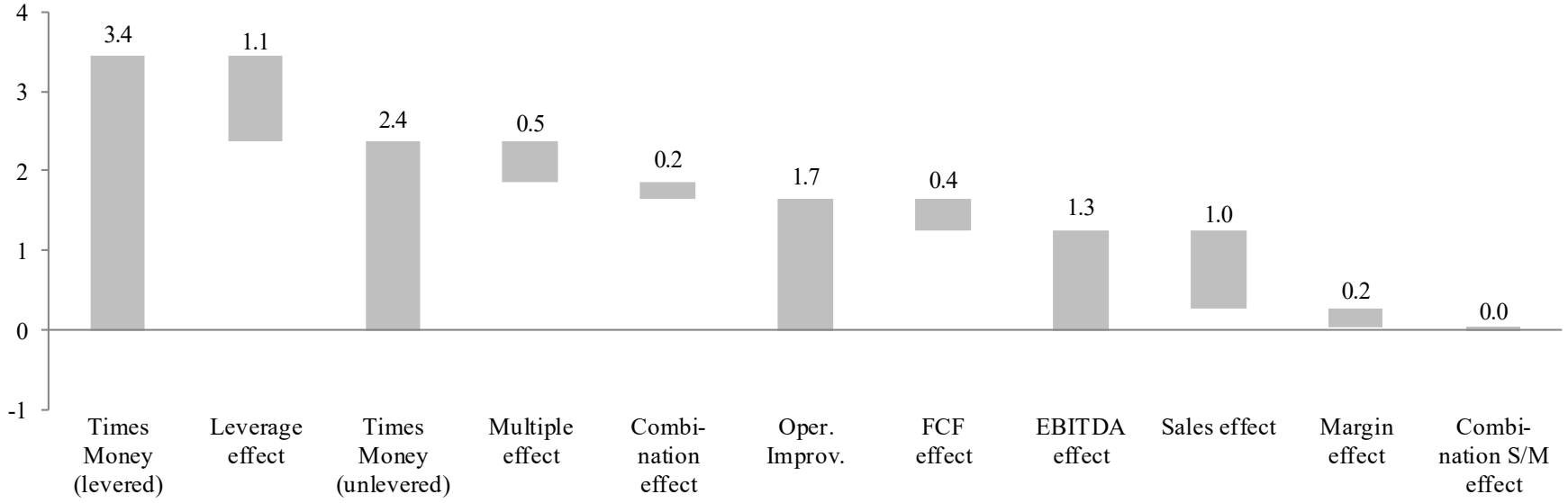
2.1.5 Findings

For our final value creation sample of 2,029 companies, we found an average levered TM of 3.4x. We also determined that 1.1x of this 3.4x increase in total value reflected the leverage effect of debt financing, and that the unlevered TM was thus 2.4x. While 0.5x of this 2.4x resulted from an increase in the transaction multiple from entry to exit, 1.7x was attributable to operating improvements that could in turn be broken down into two components—namely, the FCF (0.4x) and EBITDA (1.3x) effects. The main driver of the EBITDA improvements was, in turn, sales growth in the portfolio companies, which amounted to 1.0x—while margin improvements contributed 0.2x to the EBITDA effect. As can be seen in Figure 2-2, which presents the value creation split for the entire sample of 2,029 transactions.

Figure 2-2: Value Creation Split for Total Sample

This figure shows value creation details for our final sample of 2,029 buyouts. Panel A shows mean values of the value creation components in levered TM points. Individual effects add up as they are rescaled to unlevered Times Money. Panel B reports percentage numbers for the relative contribution of each component. Levered TM is separated into leverage effect and TM unlevered. Unlevered TM consists of the single effects from multiple, combination and operating improvement effects. Operating improvements are further separated into EBITDA, sales, margin and combination effect.

Panel A: Absolute Value Creation Drivers



Panel B: Relative Contribution of Value Creation Drivers

	Times Money (levered)	Leverage effect	Times Money (unlevered)	Multiple effect	Combi-nation effect	Oper. Improv.	FCF effect	EBITDA effect	Sales effect	Margin effect	Combi-nation S/M effect
Total sample	100%	31%	69%	15%	6%	48%	12%	37%	29%	7%	1%

These findings for our overall sample of LBO deals are largely consistent with earlier studies[34] that attribute about one third of the overall value to the leverage effect, which reflects the ability of GPs to manage relatively high levels of financial risk. In explaining the residual unlevered TM, the EBITDA effect was the single largest component, accounting for 37% of the total increase in equity value, and 54% of the unlevered TM (37%/69% = 54%). When combined, the operating gains reflected in the increases of both EBITDA and FCF contributed 48% to levered TM. By comparison, the average effect on total equity value (and thus levered TM) of multiple expansion—the ability to sell the company at a higher multiple—was a somewhat smaller 15%.

But if these findings serve to confirm previous findings using a much larger sample, the real advantage of having such a large-scale data set is the ability to provide separate analyses of value creation in different segments of the LBO market.

2.1.5.1 Value Creation by Region

In our analysis of LBO deals by investment region, we found significant differences between North American, European, and Asian transactions. As reported in Figure 2-3, total value creation was highest in North America with 3.8x, while European and Asian transactions both delivered 3.3x on average.[35] This difference between regions can be explained largely if not entirely by differences in the amount of financial risk assumed by the acquirer, as reflected in the leverage effect. This effect was estimated as 1.3x for North American deals, and 1.0x and 0.9x for European and Asian deals, respectively. After unlevering the transactions within the

[34] See, e.g., Achleitner et al. (2010).

[35] See Söffge and Braun (2014), who find a mean TM of 3.8 for 1,318 buyouts from Germany, Austria and Switzerland.

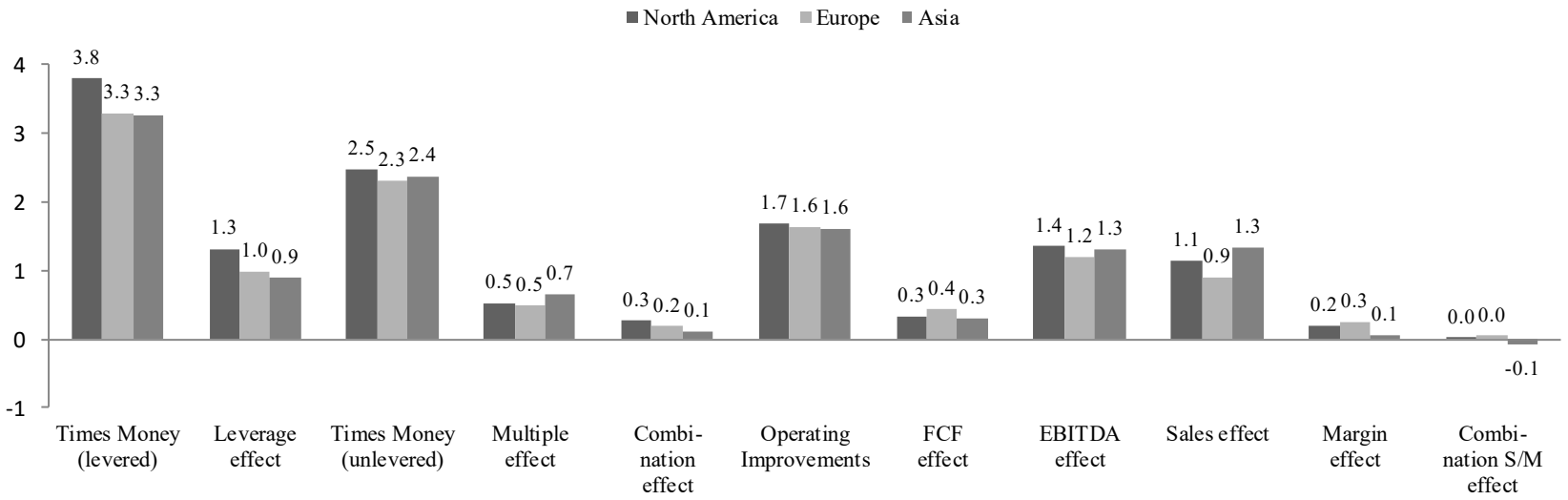
respective regions, the results were remarkably similar, with unlevered TM at 2.5x for North America, 2.3x for Europe, and 2.4x for Asia. Moreover, the contribution from increases in transaction multiples was 0.5x in both North America and Europe, and a somewhat higher 0.7x in Asia (with combination effects estimated to be 0.3x, 0.2x and 0.1x, respectively).

Operating improvements were almost equal in all regions, ranging from 1.6x to 1.7x. The largest portion of these operating gains were reflected in the increases in EBITDA, which accounted for value creation of 1.4x in North America, 1.2x in Europe, and 1.3x in Asia (with the rest reflected in the FCF effect, which contributed 0.3x in North America and Asia and 0.4x in Europe). But in explaining the EBITDA effect, larger differences were found in the sales effect, which amounted to 1.1x in North America, 0.9x in Europe, and 1.3x in Asia. Margin changes were almost equally important in all regions (while the combined sales/margin effect was minor).

Figure 2-3: Value Creation by Region

This figure shows value creation details by regions. We differentiate target companies from North America (587 deals), Europe (1,336) and Asia (88). Panel A shows mean values of the value creation components in levered TM points. Individual effects add up as they are rescaled to unlevered Times Money. Panel B reports percentage numbers for the relative contribution of each component. Levered TM is separated into leverage effect and TM unlevered. Unlevered TM consists of the single effects from multiple, combination and operating improvement effects. Operating improvements are further separated into EBITDA, sales, margin and combination effect.

Panel A: Absolute Value Creation Drivers



Panel B: Relative Contribution of Value Creation Drivers

	Times Money (levered)	Leverage effect	Times Money (unlevered)	Multiple effect	Combi-nation effect	Operating Improve-ments	FCF effect	EBITDA effect	Sales effect	Margin effect	Combi-nation S/M effect
North America	100%	35%	65%	14%	7%	44%	9%	36%	30%	5%	0%
Europe	100%	30%	70%	15%	6%	50%	13%	37%	27%	8%	1%
Asia	100%	27%	73%	20%	3%	49%	9%	40%	41%	2%	-2%

The main differences between the regions, then, are found in the leverage and sales effects. Moreover, as can be seen in Table 2-3, both the differences in leverage and in debt reduction are attributable to the longer holding period in North America than in the other regions. Moreover, the larger debt reduction in North American deals than in European deals was not offset by the higher invested capital in North America. Asian deals showed larger debt reduction than North American deals but also had much higher invested capital, which combined with the markedly lower holding period resulted in a significantly lower leverage effect.

The sales effect was highest in Asian deals, reflecting an increase in sales during the holding period that was by far the largest. And this effect was not offset by the higher invested capital in those transactions.

Table 2-3: Leverage and EBITDA Details by Region

This table shows details on the development of leverage and EBITDA for North America, Europe and Asia. Panel A shows equity, net debt, D/E ratios and holding period. Panel B shows sales, EBITDA and margin development.

	North America				Europe				Asia			
	Mean		Delta (abs)	Delta (%)	Mean		Delta (abs)	Delta (%)	Mean		Delta (abs)	Delta (%)
	Entry	Exit			Entry	Exit			Entry	Exit		
Observations	587	-	-	-	1,336	-	-	-	88	-	-	-
Panel A: Leverage Details												
Equity [USD m]	194.75	563.72	368.97	189%	141.85	404.29	262.44	185%	275.53	651.33	375.80	136%
Net debt [USD m]	353.84	439.95	86.11	24%	208.73	235.86	27.14	13%	193.04	287.61	94.56	49%
Debt/Equity [%]	182%	78%	-104%	-57%	147%	58%	-89%	-60%	70%	44%	-26%	-37%
Holding period [yrs]	-	5.22	-	-	-	4.70	-	-	-	3.73	-	-
Invested capital [USD m]	212.94	-	-	-	159.58	-	-	-	293.40	-	-	-
Panel B: EBITDA Details												
Sales [USD m]	560.54	704.14	143.60	26%	342.74	509.41	166.68	49%	394.20	812.59	418.39	106%
EBITDA [USD m]	94.62	129.39	34.77	37%	45.84	72.94	27.10	59%	156.80	276.23	119.43	76%
EBITDA/Sales [%]	21%	22%	1%	5%	17%	18%	1%	3%	22%	20%	-2%	-8%

As for the relative contribution of these "partial effects," as reported in Panel B of Figure 2-3, the use of leverage was most important in North American deals, accounting for 35% of the valued added, as compared to 30% in European transactions and 27% in Asian deals. Although unlevered TM was roughly equal, the transaction-multiple effect played the greatest role in Asian deals, contributing roughly 20% to the increase in (unleveraged) value. Operating improvements delivered half of the total value created in European and Asian deals, but only 44% in North American deals. The EBITDA effect contributed 40% of the increase in total value in Asia, and 36% and 37% in North America and Europe. Margin improvements contributed 5% to total TM in North America, 8% in Europe and 2% to total TM in Asia.[36]

[36] As can be seen in Table 2-4, our findings by region just summarized are statistically significant. Total value creation is significantly different at the 5% level. Differences in leverage are highly significant at the 1% level. The partial effects are significantly different at least at the 10% level, except for the combined sales/margin effect, which is not significant.

Table 2-4: Value Creation Details by Region

The following table shows the mean values by investment region. On the right-hand side we show the p values for the ANOVA and the one-sided T test[37], used to test for the difference in mean values between all categories and between pairs of categories. The H_0 for the ANOVA is that the mean values of the groups are equal. The H_0 for the T test is that the difference in mean values is less or more than zero, respectively. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Panel A: Absolute Value Creation Drivers

	Mean				T test (p values)		
Variable	North America	Europe	Asia	ANOVA (p value)	North America/ Europe	North America/ Asia	Europe/ Asia
Observations	587	1,336	88				
Times Money (levered)	3.8	3.3	3.3	0.02 **	0.01 ***	0.26	0.96
Leverage effect	1.3	1.0	0.9	0.00 ***	0.00 ***	0.01 ***	0.54
Times Money (unlevered)	2.5	2.3	2.4	0.45	0.20	0.77	0.84
Multiple effect	0.5	0.5	0.7	0.06 *	0.13	0.42	0.21
Combination effect	0.3	0.2	0.1	0.03 **	0.04 **	0.13	0.35
Free Cash Flow effect	0.3	0.4	0.3	0.07 *	0.04 **	0.57	0.57
EBITDA effect	1.4	1.2	1.3	0.01 ***	0.00 ***	0.15	0.82
Sales effect	1.1	0.9	1.3	0.00 ***	0.00 ***	0.85	0.26
Margin effect	0.2	0.3	0.1	0.05 *	0.30	0.05 **	0.01 **
Combination S/M effect	0.0	0.0	-0.1	0.59	0.81	0.44	0.48

[37] The T test for comparison between the groups is based on the partial effects of each deal included, whereas the relative contributions per group are calculated based on group mean values for partial effects. This does not influence the statistical validity of the test. We use this methodology in the subsequent tables for the T test by industries, size and over time consistently.

Panel B: Relative Contribution of Value Creation Drivers

Leverage effect	35%	30%	27%	0.69	0.34	0.38	0.86
Times Money (unlevered)	65%	70%	73%	0.69	0.34	0.38	0.86
Multiple effect	14%	15%	20%	0.65	0.41	0.12	0.38
Combination effect	7%	6%	3%	0.35	0.10	0.35	0.03 **
Free Cash Flow effect	9%	13%	9%	0.45	0.32	0.75	0.18
EBITDA effect	36%	37%	40%	0.75	0.52	0.10 *	0.30
Sales effect	30%	27%	41%	0.61	0.20	0.17	0.63
Margin effect	5%	8%	2%	0.89	0.69	0.38	0.26
Combination S/M effect	0%	1%	-2%	0.38	0.07 *	0.19	0.86

2.1.5.2 Value Creation by Industry

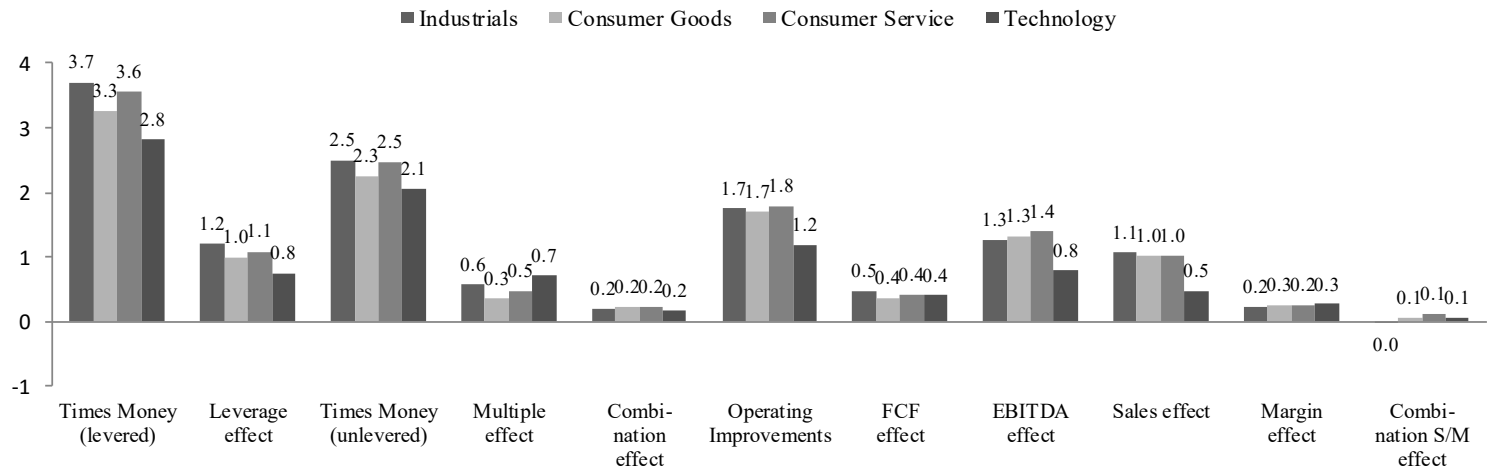
We found significant differences in value creation for the four most heavily represented industries in our sample: industrials, consumer goods, consumer service, and technology. As reported in Figure 2-4, total value creation was highest in industrials, at 3.7x, which were closely followed by consumer services, at 3.6x. Consumer goods and technology deals were both below these levels, at 3.3x and 2.8x. Higher leverage played a role in these differences, since the same ordering was also found in the attribution of leverage, which was 1.2x for industrials, 1.1x for consumer services, 1.0x for consumer goods, and 0.8x for technology transactions. The differences become smaller when the leverage effect is removed. Unlevered TM was 2.5x for industrials and consumer services, 2.3x for consumer goods, and 2.1x for technology. The transaction-multiple effect showed larger differences, with 0.6x in industrials, 0.5x in consumer services, 0.3x in consumer goods, and 0.7x in technology. Value creation from operating improvements was virtually the same in industrials (1.7x), consumer goods (1.7x), and consumer services (1.8x), but it was lower in technology deals (1.2x). And the combined effect from simultaneous changes in transaction-multiple and EBITDA was equal

across all four industries, at 0.2x. The FCF effect also showed equal levels (0.4x-0.5x) in all industries; and since operating improvements reflect the sum of FCF and EBITDA effects, the differences in operating improvements were clearly attributable to the different levels in the EBITDA effect. Whereas industrials and consumer goods deals delivered 1.3x and consumer services 1.4x, technology deals contributed only 0.8x from EBITDA improvements over the holding period. This lower EBITDA development in technology was caused by a lower sales effect of 0.5x, which was 1.1x for industrials and 1.0x for both consumer goods and services. Margin improvements were largely the same—between 0.2x and 0.3x—in all four industries.

Figure 2-4: Value Creation by Industry

This figure shows value creation details by industries. We differentiate target companies from industrials (726 deals), consumer goods (467), consumer service (327) and technology (161). Panel A shows mean values of the value creation components in levered TM points. Individual effects add up as they are rescaled to unlevered Times Money. Panel B reports percentage numbers for the relative contribution of each component. Levered TM is separated into leverage effect and TM unlevered. Unlevered TM consists of the single effects from multiple, combination and operating improvement effects. Operating improvements are further separated into EBITDA, sales, margin and combination effect.

Panel A: Absolute Value Creation Drivers



Panel B: Relative Contribution of Value Creation Drivers

	Times Money (levered)	Leverage effect	Times Money (unlevered)	Multiple effect	Combi-nation effect	Operating Improve-ments	FCF effect	EBITDA effect	Sales effect	Margin effect	Combi-nation S/M effect
Industrials	100%	32%	68%	15%	5%	47%	13%	34%	29%	6%	-1%
Consumer Goods	100%	31%	69%	11%	7%	52%	11%	41%	31%	8%	2%
Consumer Service	100%	30%	70%	13%	6%	50%	11%	39%	29%	7%	3%
Technology	100%	27%	73%	25%	6%	42%	14%	28%	17%	9%	2%

The largest differences between industries can be found in the leverage, transaction-multiple, and sales effects. As can be seen in Panel A of Table 2-5, the lower leverage effect in technology deals was caused by a comparably low debt/equity ratio, whereas the holding periods were about equal to the other industries. The higher transaction-multiple effect in technology transactions was accomplished with both higher entry and exit transaction-multiples, as well as the larger transaction-multiple increase during the holding period. As can be seen in Panel B of Table 2-5, the comparably high transaction-multiple effect in industrials was caused by the combination of rather low transaction-multiple expansion at a moderate entry valuation level, with the lowest average invested capital of the industries.

The lower sales effect in technology deals resulted from the low relative increases in sales combined with high entry sales levels. In fact, technology deals experienced the lowest relative increase in sales over the holding period, as can be seen in Panel C of Table 2-5.

Table 2-5: Leverage, Multiple and EBITDA Details by Industry

This table shows details on the development of leverage, transaction-multiples and EBITDA for Industrials, Consumer Goods, Consumer Service and Technology deals. Panel A shows equity, net debt, D/E ratios and holding period. Panel B shows enterprise values and EV/EBITDA multiples. Panel C shows sales, EBITDA and margin development.

	Industrials				Consumer goods				Consumer services				Technology			
	Mean		Delta (abs)	Delta (%)	Mean		Delta (abs)	Delta (%)	Mean		Delta (abs)	Delta (%)	Mean		Delta (abs)	Delta (%)
	Entry	Exit			Entry	Exit			Entry	Exit			Entry	Exit		
Observations	726	-	-	-	467	-	-	-	327	-	-	-	161	-	-	-
Panel A: Leverage Details																
Equity [USD m]	104.06	299.53	195.46	188%	123.80	350.58	226.78	183%	202.77	537.83	335.06	165%	427.36	827.04	399.68	94%
Net debt [USD m]	164.33	186.12	21.79	13%	195.46	230.64	35.18	18%	344.93	387.09	42.16	12%	409.19	531.23	122.04	30%
Debt/Equity [%]	158%	62%	-96%	-61%	158%	66%	-92%	-58%	170%	72%	-98%	-58%	96%	64%	-32%	-33%
Holding period [yrs]	-	4.94	-	-	-	4.94	-	-	-	4.73	-	-	-	4.47	-	-
Invested capital [USD m]	113.95	-	-	-	139.30	-	-	-	228.14	-	-	-	458.16	-	-	-
Panel B: Multiple Details																
EV [USD m]	268.40	485.65	217.25	81%	319.26	581.23	261.96	82%	547.70	924.93	377.22	69%	836.55	1,358.28	521.72	62%
EV/EBITDA	7.36	8.39	1.03	14%	7.39	8.78	1.39	19%	8.03	10.09	2.06	26%	8.60	10.98	2.37	28%
Panel C: EBITDA Details																
Sales [USD m]	300.78	435.64	134.86	45%	434.49	618.35	183.85	42%	399.48	659.86	260.37	65%	799.29	965.51	166.22	21%
EBITDA [USD m]	36.15	57.97	21.82	60%	39.59	65.53	25.94	66%	64.30	104.65	40.35	63%	122.61	165.38	42.76	35%
EBITDA/Sales [%]	16%	16%	0%	0%	16%	17%	0%	3%	19%	20%	1%	7%	23%	24%	1%	5%

As for the relative contribution of the individual effects, as reported in Panel B of Figure 2-4, we found that leverage played an almost equally important role in industrials (32%), consumer goods (31%), and consumer service (30%), but a slightly lesser role in technology deals (27%). But there were larger differences among industries in the relative importance of the transaction-multiple. In consumer goods and consumer services, multiple effects contributed only 11% and 13%, respectively, of the total value increase. The relative contribution to value was a bit larger in industrials, at 15%, but it was markedly higher in technology deals, where it delivered 25% of total value created. Of course, much of this high relative contribution of the transaction-multiple effect can be explained by the significantly lower operating improvements achieved in technology deals. Operating improvements delivered around 50% of the value increases in all industries except technology, where they contributed only 42%. The FCF effect was between 11% and 14% for all industries and thus reflected a similar absolute amount. The EBITDA effect was 34% for industrials, 41% for consumer goods, 39% for consumer services, and 28% for technology deals. Larger differences can be seen in the sales effect, which contributed 29% in industrials and consumer services, 31% in consumer goods, and a low 17% in technology deals. Margin improvements delivered between 6% and 9% and thus showed no obvious differences among industries.[38]

[38] The differences between industries mentioned above are statistically significant as seen in Table 2-6. The total value creation is significantly different between the industries at the 5% level. Differences in the leverage and sales effects are significant at the 1% level, the transaction-multiple and EBITDA effects at the 5% level and the remaining effects are not significantly different between industries.

Table 2-6: Value Creation Details by Industry

The following table shows the mean values by investment industry. On the right-hand side we show the p values for the ANOVA and the one-sided T test, used to test for the difference in mean values between all categories and between pairs of categories. The H_0 for the ANOVA is that the mean values of the groups are equal. The H_0 for the T test is that the difference in mean values is less or more than zero, respectively. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Panel A: Absolute Value Creation Drivers

	Mean					T test (p values)					
Variable	**Indus-trials**	**Cons. Goods**	**Cons. Service**	**Tech-nology**	**ANOVA (p value)**	**Industrials/ C. Goods**	**Industrials/ C. Service**	**Industrials/ Techn.**	**C. Goods/ C. Service**	**C. Goods/ Techn.**	**C. Service/ Techn.**
Observations	726	467	327	161							
Times Money (levered)	3.7	3.3	3.6	2.8	0.02 **	0.04 **	0.57	0.00 ***	0.25	0.16	0.03 **
Leverage effect	1.2	1.0	1.1	0.8	0.00 ***	0.01 **	0.22	0.00 ***	0.38	0.04 **	0.01 **
Times Money (unlevered)	2.5	2.3	2.5	2.1	0.15	0.11	0.88	0.05 *	0.25	0.39	0.10
Multiple effect	0.6	0.3	0.5	0.7	0.02 **	0.01 ***	0.06 *	0.51	0.78	0.07 *	0.12
Combination effect	0.2	0.2	0.2	0.2	0.90	0.68	0.98	0.57	0.70	0.73	0.58
Free Cash Flow effect	0.5	0.4	0.4	0.4	0.56	0.39	0.58	0.24	0.86	0.49	0.45
EBITDA effect	1.3	1.3	1.4	0.8	0.01 **	0.76	0.42	0.00 ***	0.33	0.00 ***	0.00 ***
Sales effect	1.1	1.0	1.0	0.5	0.00 ***	0.86	0.81	0.00 ***	0.96	0.00 ***	0.00 ***
Margin effect	0.2	0.3	0.2	0.3	0.86	0.39	0.80	0.75	0.61	0.76	0.91
Combination S/M effect	0.0	0.1	0.1	0.1	0.12	0.62	0.01 ***	0.34	0.04 **	0.65	0.15

Panel B: Relative Contribution of Value Creation Drivers

	Mean					T test (p values)					
Variable	**Indus-trials**	**Cons. Goods**	**Cons. Service**	**Tech-nology**	**ANOVA (p value)**	**Industrials/ C. Goods**	**Industrials/ C. Service**	**Industrials/ Techn.**	**C. Goods/ C. Service**	**C. Goods/ Techn.**	**C. Service/ Techn.**
Leverage effect	32%	31%	30%	27%	0.47	0.81	0.36	0.43	0.48	0.37	0.20
Times Money (unlevered)	68%	69%	70%	73%	0.47	0.81	0.36	0.43	0.48	0.37	0.20
Multiple effect	15%	11%	13%	25%	0.00 ***	0.92	0.06 *	0.18	0.03 **	0.17	0.06 *
Combination effect	5%	7%	6%	6%	0.65	0.30	0.21	0.56	0.68	0.92	0.77
Free Cash Flow effect	13%	11%	11%	14%	0.03 **	0.51	0.25	0.31	0.17	0.34	0.19
EBITDA effect	34%	41%	39%	28%	0.60	0.78	0.89	0.23	0.75	0.26	0.27
Sales effect	29%	31%	29%	17%	0.58	0.80	0.59	0.12	0.66	0.07 *	0.20
Margin effect	6%	8%	7%	9%	0.88	0.71	0.59	0.63	0.70	0.82	0.82
Combination S/M effect	-1%	2%	3%	2%	0.93	0.62	0.86	0.57	0.89	0.37	0.64

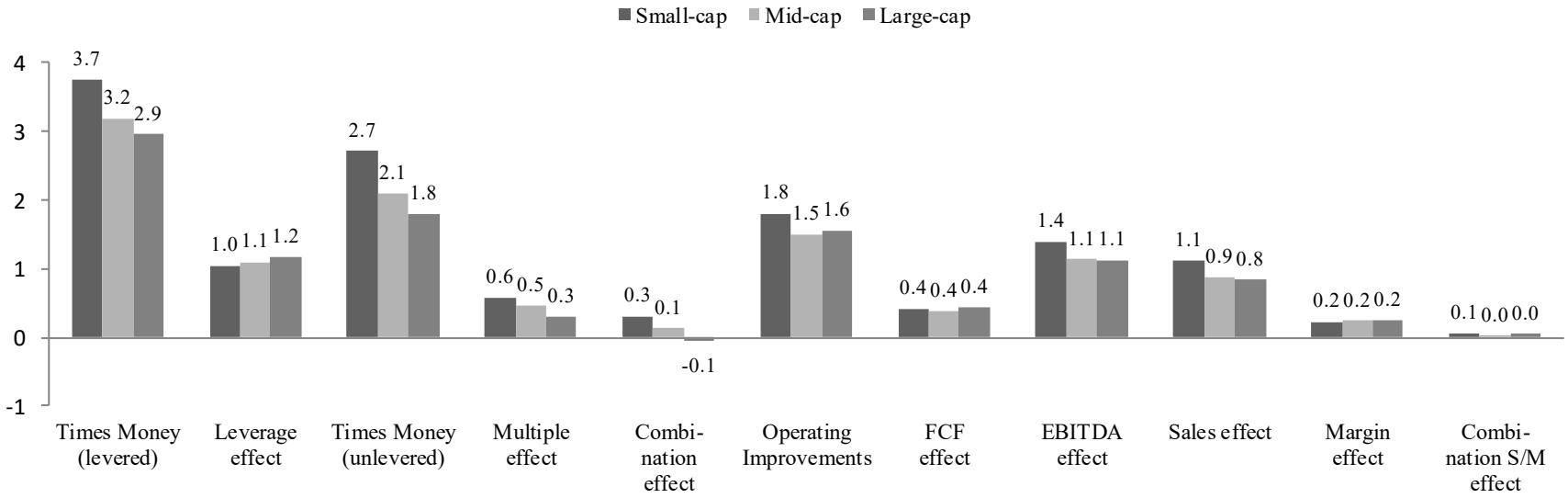
2.1.5.3 Value Creation by Transaction Size

To investigate variations in value creation contingent on size, we assigned each deal in our sample to one of three categories by their enterprise value at entry: small-cap (up to $100 million); mid-cap (larger than $100 million and up to $1 billion) and large-cap (over $1 billion). As can be seen in Figure 2-5, we found total value creation to be highest in small-cap transactions, delivering 3.7x invested capital. In mid- and large-cap transactions, we observed lower average values of 3.2x and 2.9x. The leverage effect increased incrementally but continuously with transaction size, providing for 1.0x, 1.1x, and 1.2x in small-, mid-, and large-cap deals, respectively. Reflecting the increase in leverage with deal size, the differences in unlevered Times Money were considerably larger, with TMs of 2.7x in small-cap, 2.1x in mid-cap, and 1.8x in large-cap deals after accounting for financial risk. Much of this difference was attributable to the higher transaction-multiple expansion achieved by smaller deals. Where small-cap deals delivered an average multiple expansion of 0.6x and mid-cap deals 0.5x, large-cap transactions delivered only 0.3x invested capital from growth in transaction prices. Operating improvements differed only slightly between size categories, with 1.8x in small-cap, 1.5x in mid-cap, and 1.6x in large-cap deals. With the FCF effect at 0.4x and the margin effect at 0.2x for all size classes, this difference in operating improvements stemmed mainly from differences in sales growth. Whereas small-cap deals provided 1.1x and mid-cap deals provided 0.9x, large transactions contributed 0.8x to value creation.

Figure 2-5: Value Creation by Transaction Size

This figure shows value creation details by transaction size. We differentiate small-cap (1,023 deals), mid-cap (833) and large-cap (173) transactions. Panel A shows mean values of the value creation components in levered TM points. Individual effects add up as they are rescaled to unlevered Times Money. Panel B reports percentage numbers for the relative contribution of each component. Levered TM is separated into leverage effect and TM unlevered. Unlevered TM consists of the single effects from multiple, combination and operating improvement effects. Operating improvements are further separated into EBITDA, sales, margin and combination effect.

Panel A: Absolute Value Creation Drivers



Panel B: Relative Contribution of Value Creation Drivers

	Times Money (levered)	Leverage effect	Times Money (unlevered)	Multiple effect	Combi-nation effect	Operating Improve-ments	FCF effect	EBITDA effect	Sales effect	Margin effect	Combi-nation S/M effect
Small-cap	100%	28%	72%	16%	8%	48%	11%	37%	30%	6%	1%
Mid-cap	100%	34%	66%	14%	4%	47%	12%	36%	28%	7%	1%
Large-cap	100%	39%	61%	10%	-2%	53%	15%	38%	28%	8%	2%

Table 2-7 explains the large differences in the transaction-multiple and sales effects between the size categories. As reported in Panel A of Table 2-7, the increase in transaction multiples, as well as the percentage contribution of its effect on total value, declines with increasing transaction size. Likewise, smaller transactions showed a larger relative increase in sales than mid- and large-cap deals, which resulted in the above-mentioned decline of the sales effect with increasing transaction size.

Table 2-7: Multiple and EBITDA Details by Transaction Size

This table shows details on the development of transaction-multiples and EBITDA for small-, mid- and large-cap deals. Panel A shows enterprise values and EV/EBITDA multiples. Panel B shows sales, EBITDA and margin development.

	Small-cap				Mid-cap				Large-cap			
	Mean		Delta (abs)	Delta (%)	Mean		Delta (abs)	Delta (%)	Mean		Delta (abs)	Delta (%)
	Entry	Exit			Entry	Exit			Entry	Exit		
Observations	1,023	-	-	-	833	-	-	-	173	-	-	-
Panel A: Multiple Details												
EV [USD m]	42.58	108.56	65.98	155%	320.33	641.71	321.39	100%	3,112.27	5,208.73	2,096.46	67%
EV/EBITDA	7.09	8.81	1.72	24%	8.19	9.72	1.53	19%	9.23	9.70	0.47	5%
Invested capital [USD m]	24.56	-	-	-	147.03	-	-	-	1,438.61	-	-	-
Panel B: EBITDA Details												
Sales [USD m]	62.38	104.27	41.89	67%	361.15	535.76	174.61	48%	2,703.85	3,590.63	886.78	33%
EBITDA [USD m]	7.19	13.66	6.47	90%	44.69	72.97	28.28	63%	463.41	646.24	182.84	39%
EBITDA/Sales [%]	17%	17%	0%	2%	19%	20%	1%	3%	26%	28%	3%	11%

As for the relative contributions of these individual effects, as reported in Panel B of Figure 2-5, we found that the slight increase in the leverage effect associated with larger transactions resulted in a sharply rising relative contribution of the leverage effect to total value creation, ranging from 28% in small-cap deals, to 34% and 39% in mid- and large-cap transactions. Increases in transaction-multiples accounted for 16% of the value increase in small-, 14% in mid-, and 10% in large-cap deals Operating improvements were shown to contribute 48% and 47% of the value increase in small- and mid-cap deals, and 53% in large-cap deals. The percentage contributions of both EBITDA and sales growth were virtually the same across all deals sizes. EBITDA contribution was between 36% and 38% for all sizes, and sales growth contributed 30% in small-cap deals and 28% in mid- and large-cap deals. Margin improvements also well delivered almost equal shares of 6%, 7%, and 8% with increasing transaction size.[39]

[39] The differences by transaction size are statistically significant as shown in Table 2-8. Total value creation is significantly different between deal sizes at the 1% level, as are TM unlevered, the combined EBITDA/multiple, and the sales effect. Other effects are not significantly different, at least between all size groups.

Table 2-8: Value Creation Details by Investment Size

The following table shows the mean values by investment size. On the right-hand side we show the p values for the ANOVA and the one-sided T test, used to test for the difference in mean values between all categories and between pairs of categories. The H_0 for the ANOVA is that the mean values of the groups are equal. The H_0 for the T test is that the difference in mean values is less or more than zero, respectively. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Panel A: Absolute Value Creation Drivers

	Mean				T test (p values)		
Variable	**Small-cap**	**Mid-cap**	**Large-cap**	**ANOVA (p value)**	**Small-/Mid-cap**	**Small-/ Large-cap**	**Mid-/ Large-cap**
Observations	1,023	833	173				
Times Money (levered)	3.7	3.2	2.9	0.00 ***	0.00 ***	0.01 ***	0.42
Leverage effect	1.0	1.1	1.2	0.55	0.45	0.40	0.64
Times Money (unlevered)	2.7	2.1	1.8	0.00 ***	0.00 ***	0.00 ***	0.10
Multiple effect	0.6	0.5	0.3	0.18	0.16	0.24	0.53
Combination effect	0.3	0.1	-0.1	0.00 ***	0.03 **	0.00 ***	0.06 *
Free Cash Flow effect	0.4	0.4	0.4	0.87	0.88	0.73	0.68
EBITDA effect	1.4	1.1	1.1	0.13	0.04 **	0.49	0.79
Sales effect	1.1	0.9	0.8	0.01 ***	0.00 ***	0.16	0.95
Margin effect	0.2	0.2	0.2	0.48	0.29	0.33	0.78
Combination S/M effect	0.1	0.0	0.0	0.83	0.98	0.37	0.38
Panel B: Relative Contribution of Value Creation Drivers							
Leverage effect	28%	34%	39%	0.06 *	0.02 **	0.16	0.78
Times Money (unlevered)	72%	66%	61%	0.06 *	0.02 **	0.16	0.78
Multiple effect	16%	14%	10%	0.87	0.54	0.88	0.97
Combination effect	8%	4%	-2%	0.34	0.13	0.32	0.82
Free Cash Flow effect	11%	12%	15%	0.25	0.29	0.44	0.57
EBITDA effect	37%	36%	38%	0.47	0.62	0.08 *	0.06 *
Sales effect	30%	28%	28%	0.97	0.98	0.66	0.37
Margin effect	6%	7%	8%	0.08 *	0.38	0.00 ***	0.01 ***
Combination S/M effect	1%	1%	2%	0.63	0.86	0.06 *	0.03 **

2.1.5.4 Value Creation over Time

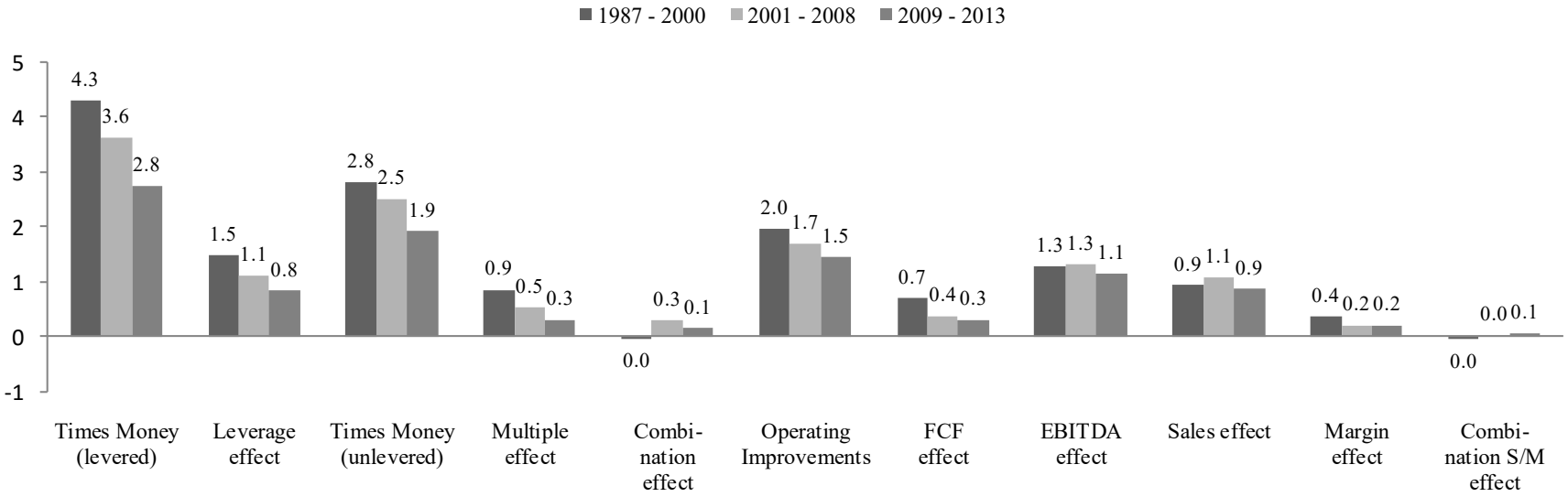
To analyze whether value creation in private equity has changed over time, we divided our sample into three periods and assigned each deal into one of the categories according to its exit year. The first period ranges from 1987, when our sample starts, to 2000, the year before the bursting of the dot-com bubble burst. The second period, from 2001 to 2008, represents the period leading up to the recent financial crisis, starting with the collapse of Lehman Brothers in August 2008. The third and last period, from 2009 to 2013, consists mainly of exists that took place during or in the wake of the crisis.

Our findings, which can be seen in Figure 2-6, show total value creation dropping over time from 4.3x (1987-2000) to 3.6x (2001-2008), and 2.8x (2009-2013). The leverage effect went down from 1.5x over 1.1x to 0.8x in most recent transactions. TM unlevered showed a similar pattern, with levered value creation estimated at 2.8x, 2.5x, and 1.9x for increasingly recent transactions. The effect of the increase in transaction multiple on the total value increase fell from 0.9x in 1987-2000 to 0.5x in 2001-2008 to 0.3x in deals from 2009-2013. Operating improvements again showed a similar pattern, dropping from 2.0x to 1.7x down to 1.5x over time. This decline in operating improvements shows up almost entirely in the FCF effect, which went down from 0.7x to 0.4x and 0.3x in the most recent deals. By contrast, the EBITDA effect remained remarkably constant throughout, at 1.3x up through 2008 and 1.1x from 2009-2013. This stability is attributable mainly to the sales effect, which was 0.9x in both the earliest and the most recent transactions, and 1.1x in the deals exited from 2001-2008. The margin effect showed a drop from 0.4x to 0.2x after 2001 and has remained at this level.

Figure 2-6: Value Creation over Time

This figure shows value creation details by exit year. We differentiate transactions with exit from 1987 - 2000 (274 deals), 2001 - 2008 (1,111) and 2008 - 2013 (644). Panel A shows mean values of the value creation components in levered TM points. Individual effects add up as they are rescaled to unlevered Times Money. Panel B reports percentage numbers for the relative contribution of each component. Levered TM is separated into leverage effect and TM unlevered. Unlevered TM consists of the single effects from multiple, combination and operating improvement effects. Operating improvements are further separated into EBITDA, sales, margin and combination effect.

Panel A: Absolute Value Creation Drivers



Panel B: Relative Contribution of Value Creation Drivers

	Times Money (levered)	Leverage effect	Times Money (unlevered)	Multiple effect	Combi-nation effect	Operating Improve-ments	FCF effect	EBITDA effect	Sales effect	Margin effect	Combi-nation S/M effect
1987 - 2000	100%	34%	66%	20%	0%	46%	16%	30%	22%	8%	0%
2001 - 2008	100%	31%	69%	15%	8%	47%	10%	36%	30%	6%	1%
2009 - 2013	100%	30%	70%	11%	5%	53%	11%	41%	31%	8%	2%

As can be seen in Table 2-9, there were large differences over time in the leverage, transaction-multiple and FCF effects. The period 1987-2000 was the only one in which debt was actually reduced over the holding period. In the next two periods, the average amounts of debt carried by the portfolio companies actually increased, and after starting from a much higher leverage base at entry. Thus, the average D/E ratios first dropped and then increased again over our time categories. Moreover, the length of the average holding periods increased from 4.0 years during the first two time periods to 5.4 years in the case of the most recent deals.

As shown in Panel B of Table 2-9, although the entry transaction multiples stayed roughly constant over time, the multiple expansion during the holding period dropped over time, from 3.24 points in the first period to just 0.87 points in recent times. There was also a drop in the FCF effect over time, one that can be explained by increasing variations in FCF over time combined with an even larger increase in invested capital into the deals, as shown in Panel C of Table 2-9. (As mentioned earlier, FCF is calculated as the sum of debt repayments, dividends, and additional equity injections during the holding period.)

Table 2-9: Leverage, Multiple and FCF Details over Time

This table shows details on the development of leverage, transaction-multiples and FCF over time. Panel A shows equity, net debt, D/E ratios, holding period and invested capital. Panel B shows enterprise values and EV/EBITDA multiples. Panel C shows capital injections and dividends during the holding period.

	1987 - 2000				2001 - 2008				2009 - 2013			
	Mean		Delta (abs)	Delta (%)	Mean		Delta (abs)	Delta (%)	Mean		Delta (abs)	Delta (%)
	Entry	Exit			Entry	Exit			Entry	Exit		
Observations	274	-	-	-	1,111	-	-	-	644	-	-	-
Panel A: Leverage Details												
Equity [USD m]	38.40	163.14	124.74	325%	159.73	456.88	297.15	186%	239.39	615.87	376.48	157%
Net debt [USD m]	86.51	71.23	-15.28	-18%	214.90	263.43	48.53	23%	379.19	443.48	64.29	17%
Debt/Equity [%]	225%	44%	-182%	-81%	135%	58%	-77%	-57%	158%	72%	-86%	-55%
Holding period [yrs]	-	4.00	-	-	-	4.71	-	-	-	5.36	-	-
Invested capital [USD m]	43.25	-	-	-	190.06	-	-	-	269.37	-	-	-
Panel B: Multiple Details												
EV [USD m]	124.92	234.37	109.45	88%	374.63	720.32	345.69	92%	618.58	1,059.35	440.76	71%
EV/EBITDA	7.53	10.76	3.24	43%	7.64	9.14	1.51	20%	7.96	8.82	0.87	11%
Panel C: FCF Details												
Capital injections [USD m]	-	4.85	-	-	-	30.33	-	-	-	29.98	-	-
Dividends [USD m]	-	33.76	-	-	-	135.35	-	-	-	179.78	-	-
FCF variation [USD m]	-	44.20	-	-	-	56.49	-	-	-	85.51	-	-
FCF variation / inv. cap.	-	1.0	-	-	-	0.3	-	-	-	0.3	-	-

The relative contributions of the effects are summarized in Panel B of Figure 2-6. With leverage declining over time along with the total value creation, the relative contribution of the leverage effect also falls, although more moderately than the leverage ratios themselves, from 34% in the earliest deals to 30% in the most recent. The percentage contribution to value of the multiple effect dropped from 20% in 1987-2000, to 15% in 2001-2008, and to 11% in 2009-2013. Operating improvements gained in relative importance (despite a drop in absolute contribution) from 46% in the early years, to 47% in deals after 2001, and to 53% in deals from 2009-2013. The FCF effect contributed 16%, 10%, and 11% in the consecutive periods. EBITDA contribution, though roughly constant in absolute terms, also increased its relative contribution, from 30% in the early years, to 36% in the time up to the financial crisis, and to 41% after 2008. The sales effect increased from contributing 22% to 30% and 31%, whereas the margin effect was roughly constant between 6% and 8% over time.[40]

[40] The results over time are highly significant, as seen in Table 2-10. All individual effects are significantly different between time categories, at least at the 5%, mostly at the 1% level. The results also show that the differences are almost all pairwise significant between the time groups.

Table 2-10: Value Creation Details over Time

The following table shows the mean values by exit year. On the right-hand side we show the p values for the ANOVA and the one-sided T test, used to test for the difference in mean values between all categories and between pairs of categories. The H_0 for the ANOVA is that the mean values of the groups are equal. The H_0 for the T test is that the difference in mean values is less or more than zero, respectively. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

Panel A: Absolute Value Creation Drivers

	Mean				T test (p values)		
Variable	**1987-2000**	**2001-2008**	**2009-2013**	**ANOVA (p value)**	**87-00/ 01-08**	**87-00/ 09-13**	**01-08/ 09-13**
Observations	274	1,111	644				
Times Money (levered)	4.3	3.6	2.8	0.00 ***	0.02 **	0.00 ***	0.00 ***
Leverage effect	1.5	1.1	0.8	0.00 ***	0.00 ***	0.00 ***	0.00 ***
Times Money (unlevered)	2.8	2.5	1.9	0.00 ***	0.12	0.00 ***	0.00 ***
Multiple effect	0.9	0.5	0.3	0.00 ***	0.00 ***	0.00 ***	0.00 ***
Combination effect	0.0	0.3	0.1	0.00 ***	0.00 ***	0.05 *	0.04 **
Free Cash Flow effect	0.7	0.4	0.3	0.00 ***	0.00 ***	0.00 ***	0.86
EBITDA effect	1.3	1.3	1.1	0.02 **	0.81	0.16	0.00 ***
Sales effect	0.9	1.1	0.9	0.00 ***	0.66	0.13	0.00 ***
Margin effect	0.4	0.2	0.2	0.01 ***	0.05 *	0.03 **	0.59
Combination S/M effect	0.0	0.0	0.1	0.01 **	0.08 *	0.04 **	0.41
Panel B: Relative Contribution of Value Creation Drivers							
Leverage effect	34%	31%	30%	0.98	0.83	0.93	0.88
Times Money (unlevered)	66%	69%	70%	0.98	0.83	0.93	0.88
Multiple effect	20%	15%	11%	0.41	0.19	0.27	0.90
Combination effect	0%	8%	5%	0.07 *	0.23	0.12	0.34
Free Cash Flow effect	16%	10%	11%	0.66	0.79	0.52	0.43
EBITDA effect	30%	36%	41%	0.76	0.52	0.26	0.70
Sales effect	22%	30%	31%	0.89	0.55	0.72	0.67
Margin effect	8%	6%	8%	0.66	0.95	0.62	0.27
Combination S/M effect	0%	1%	2%	0.50	0.67	0.31	0.26

2.1.6 Conclusion

This paper presents large-scale and up-to-date empirical evidence on value creation patterns among LBOs of different transaction sizes and in different regions and industries. Using a proprietary sample of more than 2,000 buyout deals that we obtained from three large institutional investors that supply capital as LPs, our findings show detailed patterns of how GPs were actually able to create value over the holding period of their investments. We provide valuable insights confirming that the region and industry of a portfolio company, as well as the size of the transaction and time period in which it takes place, all play important roles in explaining different levels and patterns of value creation in private equity transactions. The results are highly relevant and important for both practitioners and academics in understanding how value is created in PE transactions.

For our entire sample of LBO transactions, the average value created over the past 30 years has been 3.4x invested capital. In other words, at the company level and before GP compensation schemes, invested equity has been more than quadrupled during the holding period. We also estimate that 31% of this value creation was achieved by taking financial risk through levered financing of the transactions. Another 48% of these increases in value have been produced through operating improvements within the portfolio companies, which can be attributed to the excellence (and incentives of) operating management under the oversight of the GP—as well as, in some cases, beneficial changes in the industry. By comparison, only 15% of such value gains are estimated to have come from increases in the transaction-multiple from entry to exit, which could reflect management's success in increasing the growth prospects of the portfolio company as well the GP's skill or luck in market timing or negotiations with

buyers or sellers. All in all, these are impressive results, though with interesting variations across countries, industries, and time periods that our study was designed to explore.[41]

After dividing our entire sample of deals by region, we found that North American transactions delivered a slightly higher value creation—an enterprise value 3.8 times the value of the initial transaction, as compared to 3.3x in both European and Asian deals. But this difference largely disappeared after we adjusted for the effects of the higher leverage and financial risk used by American portfolio companies in creating this value. We attribute the higher leverage in North American deals to the very large and sophisticated PE market and banking sector. Asian deals, on the other hand, generated more of their operating improvements through sales growth than deals in North America and Europe. Asian deals also profited much more from more robust local economic growth, as reflected in the higher revenue growth of companies across the region.

We also found differences in value creation patterns among industries, and their underlying business models. Technology deals stood out both for their limited use of leverage and smaller increases in sales, but larger increases in transactions prices and multiples over the holding period. To us, this appears in line with the sentiment that technology is an industry rather to a larger extent by investor expectations for growth than by increases in current operating cash flows.

But if region and industry have major effects on value creation, an even larger role was played by the size of the transaction. Deals with an enterprise values below $100 million delivered significantly higher value creation, again measured as a multiple of total invested

[41] The selection bias mentioned in the introduction makes more detailed analyses for a less biased sample necessary.

capital, than larger deals. While the leverage effect contributed pretty much equal proportions of value across all deal sizes, smaller transactions gained much more from multiple expansion than mid-cap and large-cap deals, in part because smaller companies tend to be purchased at lower multiples. And smaller companies also were more successful at expanding sales, at least in percentage terms.

Perhaps the most surprising finding, however, was the extent to which value creation has declined over time. Although decreasing returns over time are consistent with economic logic and increase competition for deals, the sheer size of the effect was remarkable. Whereas transactions that were sold or otherwise exited before the year 2000 were able to achieve 4.3x their investment, recent transactions exited after 2008 delivered only 2.8x. Moreover, there was a decline in each of the value creation components over time, except for the sales effect, as well as a shift in the relative contribution to value of each. For example, the use of leverage has decreased over time in both absolute and relative terms. At the same time, operating improvements, while falling in absolute terms, have increased in relative importance, as measured by their percentage contribution to the total values. And increasing market prices for deals, as reflected in multiple expansion, have also played a smaller role in overall value creation in recent years. But within the category of operating improvements, the effect of increases in EBITDA on value creation has remained remarkably constant, both in the form of increases in sales and in margins, showing the importance of operational involvement in portfolio companies.

The message from these findings is that the private equity industry appears to be navigating through an increasingly competitive “new normal”. The role of financial engineering appears to have become secondary, while GPs find it necessary to go deeper into their portfolio

companies to find the operating improvements that will support the higher prices many have been willing to pay.

In sum, our findings provide a portrait of an increasingly global industry that is also maturing. In our view, this means that choosing the right fund to invest in has become more difficult for limited partners, and the heuristics of judgment that rely heavily on past fund performance may have become outdated. Along with superior deal selection and negotiation, GPs must also demonstrate effective ongoing participation in the oversight and management of their portfolio companies to continue to provide sufficiently high returns keep attracting limited partners. Doing so is not an alternative but an imperative of the new normal facing private equity.

2.2 Essay 2: Deal Pricing and Returns in Private Equity

Abstract

EV/EBITDA multiple expansion in Private Equity (PE) transactions strongly influences deal returns. As multiple expansion is the result of deal pricing differences between entry and exit, this paper attempts to shed light on how relative deal pricing influences multiple expansion and deal returns. We analyze the influence of both market price levels and of relative pricing in comparison to those market prices on EV/EBITDA multiple expansion. Further, we analyze the influence of this relative pricing on final deal returns. We use a sample of 2,174 unique PE transactions. We find that multiple expansion is an important factor in explaining deal returns. Further, we find that buying low and selling high in comparison to market prices from the same segment positively influences multiple expansion. While there is a need for both, selling high yields about twice as much as buying low. We attribute a skillset to general partners who are investing in PE deals, as they can influence the pricing when buying or selling companies through their negotiations. As a negotiation is something entered into consciously, the outcome – resulting in deal pricing – is not based purely on good or bad luck. This means that limited partners providing capital to PE funds should look for fund managers with this skillset as it can help achieve higher than normal returns in their transactions and funds.

Keywords: Private Equity, Value Creation, Leveraged Buyouts, Pricing, Multiple Expansion

JEL Classification Code: G24, G30, G34

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Current status: Working paper

Introduction

Private Equity (PE) is an industry that has developed strongly during the past 30 years and is still growing in size and importance. In 2014, according to Bain & Company (2015), exit transaction values worldwide amounted to USD 456bn, up an astonishing 66% from the previous year and still 29% above the pre-crisis record-high of USD 354bn from 2007. Not only is PE a growing asset class, it has also reached a size at which it cannot be considered niche or marginal anymore. Besides the pure growth in size, PE as an industry has also matured over the years, showing a development similar to that in other asset classes. Sensoy et al. (2014) attribute this increasing maturity to both declining returns and declining importance of having access to the industry. Braun et al. (2016) show that former persistence of returns has disappeared since the late 1990s. Puche et al. (2015) find that value creation has come down drastically and rate this as a sign of the ongoing maturation of the industry. Competition for deals has also increased. Most General Partners (GPs) have experienced that proprietary deals are becoming fewer as portfolio companies, M&A advisors, and banks are becoming more professional, and transactions are more often decided in auctioned processes with several investors involved.[42] Another indication is the variety of other actors also involved in the market that PE firms are active in. Where in the late 1970s and 1980s PE firms were focused almost exclusively on leveraged buyouts, nowadays they are active in a market where strategic investors, hedge funds, venture capital firms, and investment banks are actively buying and selling majority or minority stakes in companies. Furthermore, PE firms themselves are making club deals, minority

[42] For the impact of increasing competition see Braun et al. (2015)

investments, and their limited partners (LPs) are co-investing in the original deals, driving up the number of other players participating.

In this environment within the PE industry it is becoming increasingly difficult for investors to achieve extraordinary returns. GPs collect fund commitments from their LPs in order to invest into profitable deals, thus, LPs outsource identifying and actually conducting the transactions. In doing so, they depend on and expect that the GPs have expertise in deal selection and in making profitable investments through managing the portfolio companies efficiently. In order to understand the influence a GP has on returns, we need to understand the drivers for deal returns. Previous research highlights the influence of leverage on returns. Research shows that there is indeed a strong argument for the importance of debt for returns, as shown by Axelson et al. (2013). Engel et al. (2012) find a positive relationship between leverage and deal returns, with a border at which over-leverage can happen. However, leverage is only one driver of PE deal returns. Another factor commonly analyzed are operating improvements and herein especially Enterprise Value (EV)/EBITDA multiple expansion. Acharya et al. (2013) find that higher abnormal performance of PE is related to sales and margin improvements, i.e., operating improvements. Achleitner et al. (2010) find that operating improvements make up two-thirds of total value created and EBITDA multiple expansion contributing 20 percentage points of those two-thirds. Achleitner et al. (2011) find that "besides leverage and operational improvements, EBITDA multiple expansion (…) is a fundamental factor in explaining equity returns". Puche et al. (2015) confirm this, finding that EBITDA multiple expansion is an important factor contributing over one-third to PE value creation on a transaction level.

EV/EBITDA multiple expansion is the difference between the prices paid for a portfolio company at entry and at exit. Thus, when going into a detailed analysis of multiple expansion,

understanding how prices are achieved in the market for transactions is key. As this is a market inhabited by professional investors and with a certain number of transactions being conducted regularly, there will also be a certain market price level, reflecting current supply and demand for transactions. When studying the influence of such market price levels, one inevitably reaches the question of how relative deal pricing, i.e., pricing of a deal compared to market price levels, influences multiple expansion and thus deal returns.

Gompers and Lerner (2000) introduced the phenomenon of "money chasing deals" in 2000, describing the phenomenon that increasing inflows into venture capital funds increase the valuations, i.e., prices, of the investments these funds subsequently undertake. A similar mechanism can be expected to take effect in PE, where increasing amounts of capital operating in the market for company stakes should not leave transaction prices unchanged.

When structuring transactions, GPs often assume that the EV/EBITDA multiple expected for the deal exit is the same as the EV/EBITDA multiple they pay at deal entry. This means that when investing in a company they do not explicitly consider EBITDA multiple expansion in their ex ante planning. However, when looking at actual entry and exit EBITDA multiples from past transactions, one can see that in fact exit multiples are usually higher than entry multiples. Figure 2-8 shows exactly that. As shown in Puche et al. (2015), multiple expansion indeed contributes to achieving good returns. Although it may not be the original focus of most investors when initially undertaking an investment, it proves to be an important component for deal returns and thus its influence needs to be noted.

In order to grasp the importance of multiple expansion for deal returns and to understand the influence of deal pricing on multiple expansion we set the following focus. First, we analyze the influence of multiple expansion on deal returns. Second, we analyze how market price levels

influence multiple expansion. Third, we analyze how relative deal pricing in comparison to market price levels influences multiple expansion and, ultimately, deal returns.

We analyze deal pricing on a transaction level using a cross-sectional sample ranging from 1984 until 2013. The sample contains 2,174 transactions conducted in North America, Europe and Asia as well as in different industries and with different transaction sizes.

First, we define deal pricing as the EV/EBITDA multiple, either at entry or at exit of a portfolio company. Thus, we generate two pricing indications for each deal, which we can also set in relation to each other. Next, we compare deal pricing both at entry and at exit with the pricing in other deals from the same market segment. The relevant market segment is defined for each deal individually based on transaction size (enterprise value), industry and region. For each entry and exit transaction we include only those deals in the market segment for comparison that were conducted during the four months before or after the specific transaction, i.e., we define a time window of nine months (four pre-deal, four post-deal and the deal month).[43]

Next, by comparing deal pricing with the pricing in the market segment we are able to understand the relative pricing of each deal in comparison to the relevant market segment, both at entry and exit. Based on this relative pricing we define a pair of GP skills that can be seen during each transaction. These GP skills are based on the ability to buy for lower (at entry) or sell for higher (at exit) prices than the respective market segment is being priced at on average.

[43] Nine months are a usual time for a transaction to be carried out. The interval is robust to other lengths, as will be specified in the next section.

When selling a company, another factor comes into play, possibly increasing exit pricing for the GP: Positively influencing the underlying operating business and thus EBITDA as the basis for pricing should yield a higher exit price. Lastly, the development of the market during the holding period of the deal is regarded as market development, thus representing no peculiar skillset of the investor.

We regard the ability to buy at lower or sell at higher prices as a specific skill of GPs rather than pure luck, in line with Achleitner et al. (2011). Each transaction requires a negotiation between the seller and the buyer, and any factors that find their way into the valuation of the transaction will ultimately determine deal pricing. As hardly any GP will leave the pricing offer of the seller or buyer untouched, being able to negotiate well should pay off in terms of a lower (higher) final price when buying (selling) a company. We are aware that one can also argue with the increasing maturity and efficiency of the PE market. This argumentation states that, as in any efficient market, there is no room for skills due to the high number of participants and transactions in a market. We see the increasing maturity of PE but do not regard it as sufficiently efficient yet. Especially as the number of available transactions is limited and each one of them is so individual that comparing them as if they were equal is misleading.

The paper proceeds as follows. In Section 2.2.1 we present the underlying data and the relative pricing we define as the basis for our analyses. Section 2.2.2 presents our results on how EBITDA multiple expansion drives deals returns, and is itself driven by market pricing levels. Further, we present EBITDA multiple expansion explained by market development and relative pricing. Section 2.2.3 discusses our results and section 2.2.4 concludes.

2.2.1 Data and Methodology

Our initial dataset comprises 3,344 unique private equity investments, i.e., leveraged buyouts.[44] We obtained the data for these transactions from three large institutional investors serving as LPs in PE funds. These investors collect information about the funds they consider investing in during due diligence. The GPs seeking commitments for their funds present a detailed track record of all their past transactions to these prospective LPs. As the data is presented and analyzed before a decision about an investment is made, the data we obtained from the LPs also contains transactions of GPs whose funds the LPs did not subsequently invest in. The information was provided to us anonymously; we know neither company, nor fund or GP names.

The data contains fund-level information such as fund size, fund generation and founding date of the GP. Additionally, we know which deals, funds and GPs belong together. On a deal-level, the data contains qualitative information such as country, region, and industry of the portfolio company. The quantitative information on deal-level contains monthly gross cash flows between the portfolio company and the fund, which enables us to calculate performance measures such as IRR and Money Multiple (MM). Moreover, we have obtained transaction values at entry at exit, their debt and equity portions, as well as information about sales and EBITDA at entry and exit for a subsample of the dataset. Based on this, we are able to calculate EV/EBITDA multiples which are key for our analyses. We are aware that there is likely an upward bias in our sample. We do believe, however, that this does not represent a major issue, as our analyses are cross-sectional in nature. While comparing transaction pricing with a market

[44] It is a subset of transactions from a sample already used in Puche et al. (2015), Braun et al. (2015) and Braun et al. (2016) .

level that is made up entirely from our sample, we are comparing good deals with good deals. The influence of certain GP and deal characteristics on pricing skills should be visible nonetheless. Additionally, it is important to note again that our sample contains investments not only from funds subsequently invested in, but also from funds the LPs did not invest in after their analyses.

Our final sample we use for the analyses comprises those transactions that contain the variables needed, i.e., a complete cash-flow pattern, EV/EBITDA multiples, sales and EBITDA figures as well as country and industry information. We only use fully realized deals, as any deals without an exit do not contain meaningful EV/EBITDA exit multiples. Just as Jenkinson et al. (2013) as well as Phalippou and Gottschalg (2009) find that net asset values do not provide reliable estimates for final returns, the same is true for EV/EBITDA multiples calculated on the basis of these net asset values. Thus we exclude all unrealized deals. The final sample comprises 2,174 buyout transactions realized between 1984 and 2013, and offers a representative distribution across regions, industries, and size categories.

Table 2-11 presents descriptives for our dataset. Panel A presents Median IRR, MM, holding period, EV/EBITDA at entry and exit. Partially realized transactions were excluded to obtain the final sample of 2,174 realized transactions. In terms of performance the median IRR is 37% and the median MM is 2.7. Median entry pricing is 6.6x and exit pricing is 8.2x EBITDA. Panel B of Table 2-11 presents our sample by transaction size, i.e., EV at entry. Small-cap deals have an EV of up to USD 100m, mid-cap deals have an EV between USD 100m and USD 1,000m while large-cap deals have an EV of over USD 1,000m. Panel C of Table 2-11 shows the distribution by investment countries in our sample, where Europe is the most frequently present region, followed by North America, Asia, and the rest of the world. Median IRR, MM und EV/EBITDA values are similar across regions. Panel D shows the

sample by industries, based on four-digit Industry Classification Benchmark (ICB) codes and split into ten categories. Most transactions stem from Industrials, Consumer Goods and Consumer Services. Finally, Panel E and F present the sample, split by entry and exit year categories. As can be seen, the majority of deals have been bought between 1990 and 2008 and sold between 1996 and 2012, which fits well with the 4.5 years median holding period shown in Panel A of Table 2-11. The descriptive statistics reported for these time categories support a common notion in private equity, i.e., decreasing deal returns in terms of MM over time. Moreover, although entry prices have risen, so have exit prices.

Table 2-11: Sample Descriptives

This table shows sample descriptives for the overall sample as well as for the final sample of realized deals only. The figures shown include median IRR, MM, holding period as well as entry and exit EV/EBITDA. Panel A shows the overall sample by realization status. Panel B shows the final sample by transaction size, with thresholds at USD 500m and USD 1,000m. Panel C shows the final sample by country of the portfolio company. Panel D shows the final sample by industries, based on ICB codes. Panels E and F show the final sample by entry and exit year.

		Median				
Panel A: Deal Status	**Obs.**	**IRR**	**MM**	**Holding period [years]**	**EV/EBITDA (entry)**	**EV/EBITDA (exit)**
Partially realized	887	20%	1.87	4.00	6.90	7.61
Realized	2,174	37%	2.69	4.50	6.56	8.19
All deals	**3,344**	**30%**	**2.33**	**4.17**	**6.77**	**8.03**
Realized deals only						
Panel B: Transaction Size [USD m]						
Small Cap	1,219	39%	2.76	4.58	5.93	7.56
Mid Cap	817	35%	2.66	4.33	7.29	8.80
Large cap	138	33%	2.34	4.17	8.33	8.54
Panel C: Investment Countries						
Europe	**1,432**	**36%**	**2.61**	**4.42**	**6.55**	**8.20**
UK	424	37%	2.55	3.96	7.14	9.16
Germany	140	39%	2.78	4.96	5.89	7.33
France	260	33%	2.48	4.17	6.52	7.66
Italy	134	40%	2.53	4.75	5.41	7.42
Netherlands	93	33%	2.29	4.75	5.52	6.51
Spain	56	30%	2.29	4.79	6.94	9.02
Sweden	130	46%	3.28	5.04	7.18	8.60
Other	195	36%	2.62	4.67	6.60	8.26
North America	**624**	**37%**	**3.06**	**4.83**	**6.59**	**8.08**
USA	582	36%	3.05	4.83	6.57	8.02
Other	42	45%	3.59	4.88	6.78	9.30
Asia	**92**	**42%**	**2.54**	**3.29**	**6.37**	**8.75**
Rest of the world	**26**	**33%**	**2.24**	**4.63**	**5.51**	**9.30**
Panel D: Industries						
Oil & Gas	19	71%	2.68	2.50	5.88	10.27
Basic Materials	60	29%	2.39	5.17	5.60	6.68
Industrials	727	41%	2.84	4.67	5.90	7.57
Consumer Goods	482	33%	2.50	4.58	6.64	7.91
Health Care	156	35%	2.98	4.83	7.05	9.43
Consumer Services	370	35%	2.55	4.29	7.54	8.90
Telecommunications	49	43%	2.62	3.75	7.12	8.14
Utilities	12	43%	3.52	4.17	6.31	7.06
Financials	70	49%	2.62	4.25	7.20	9.72
Technology	175	41%	2.89	4.42	6.96	9.54

		Median				
Panel E: Entry Year	**Obs.**	**IRR**	**MM**	**Holding period [years]**	**EV/EBITDA (entry)**	**EV/EBITDA (exit)**
1984-1989	71	47%	3.53	4.75	5.90	6.95
1990-1995	353	38%	3.08	5.42	6.15	7.66
1996-2000	778	29%	2.52	5.33	6.62	7.68
2001-2004	662	46%	2.81	4.08	6.50	8.66
2005-2008	299	40%	2.44	3.25	7.27	9.09
2009-2012	11	48%	1.81	1.50	11.99	10.26
Panel F: Exit Year						
1984-1989	16	59%	2.76	2.38	5.42	8.02
1990-1995	88	75%	3.84	3.25	6.12	7.89
1996-2000	390	48%	2.85	3.58	6.35	7.71
2001-2004	441	34%	2.71	4.50	6.18	7.50
2005-2008	873	35%	2.63	4.58	6.67	8.50
2009-2012	366	29%	2.61	5.50	7.12	8.56

The main variables we use in our analyses are the relative prices paid at both deal entry and exit, in terms of EV/EBITDA multiple compared to the market level. For both entry and exit of each transaction, we compare deal pricing with the pricing in other deals from the same market segment. The relevant market segment is defined for each deal individually, based on transaction size (EV), industry, region, and time. For each entry and exit transaction we include only those deals in the market for comparison that were conducted during a relevant time window of nine months. This time window is calculated individually for each deal. It is robust to other lengths, and to other start and end points relative to the deal as well[45]. Finally, in order to correctly characterize the market, we compare each entry and exit transaction with all entries and all exits that are taking place in the specific market segment and during the respective time window. Based on this criteria, the average market segment for each deal consists of 14 and 16 deals on average for entry and exit, respectively. That way we capture a relevant market price

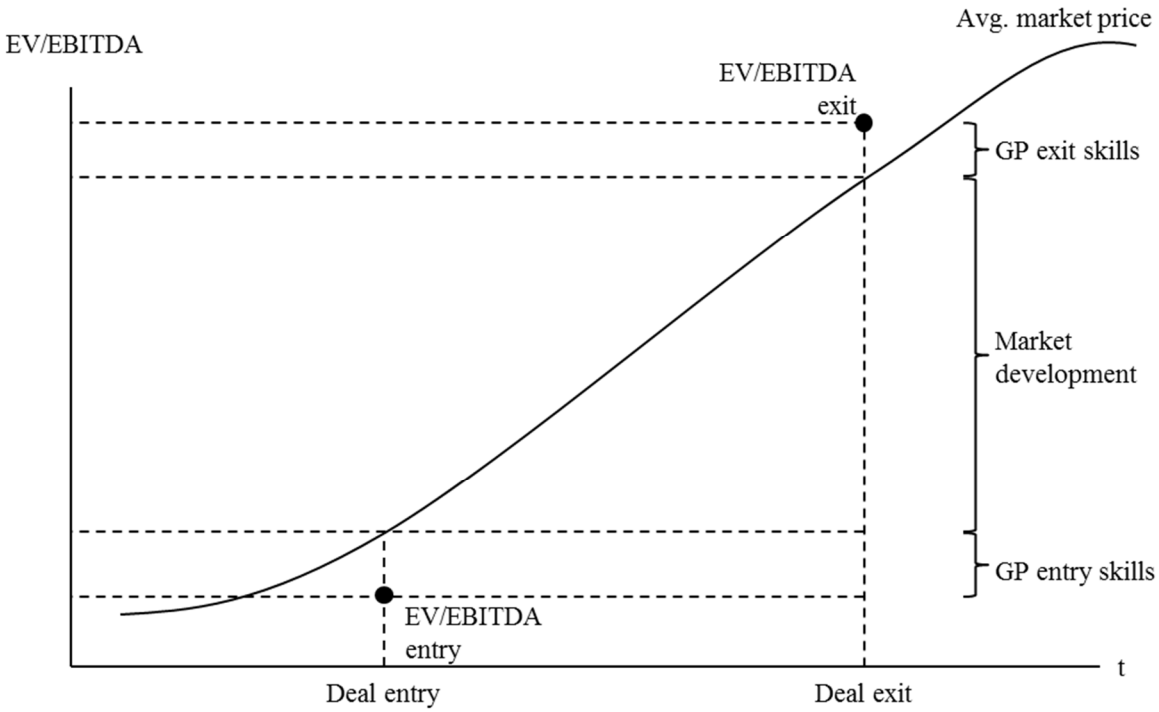
[45] E.g., not a split of four months before and four months after the entry and exit, but a split of three months before and five months after entry and exit.

level, as sellers and investors can have manifold backgrounds, and they can both be financial investors as well as strategic investors. Moreover, for each deal there is both a seller and a buyer, which is why we believe this to be an accurate picture of the market.

Based on the actual deal pricing, and in relation to the market we divide the total EV/EBITDA multiple expansion into three components. The difference of deal entry pricing to the market level at entry is referred to as “GP entry skills”. The difference of deal exit pricing to the market level at exit is referred to as “GP exit skills”. The remainder, the difference in market pricing levels from entry to exit is referred to as “market development”. Figure 2-7 shows this comparison and the split of effects.

Figure 2-7: GP Skills and Market Development

This figure shows the split of total EV/EBITDA multiple expansion within a deals into GP entry and exit skills as well as the market development. Entry/exit skills are defined as the difference between actual deal pricing at entry/exit and the average market price based on the same market segment (both entries and exits with similar size, from the same region and industry and within a nine-month window of the actual deal). Both entry and exit skills are defined as positive skills, i.e., entry skills are positive when a deal is priced below the market and exit skills are positive when a deal is priced above the market. The market development captures the difference in market pricing at entry and at exit, representing the portion of multiple expansion that is not influenced by the GP.



We argue that being able to price better than the market represents a skillset of the GP, which is why we call these GP entry and exit skills. Any GP interested in buying or selling a company is in negotiations with other market participants. Those others may in turn have other deals or investors at hand they could buy from or sell to. The GP interested in a transaction has a clear incentive to acquire or sell deals at favorable prices in order to enlarge EV/EBITDA multiple expansion, and thus his return. We see a clear incentive for favorable pricing for the GP, and grant that the GP knows of this influence. It is in the interest of any GP not to let transaction pricing "just happen", but to take an active part whenever possible. We therefore

award the GP a certain set of skills if he is able to price a transaction below or above a given market level at the time of the transaction entry or exit, respectively.

When conducting our analyses we use a consistent set of variables to control for deal, GP, and fund characteristics. We control for transaction size at entry, i.e., EV in USD m, as different transactions sizes represent different market segments with different pricing behavior of the participants. We control for debt levels of the transactions, i.e., debt/equity at entry, debt/EBITDA at entry and the change in debt/equity during the holding period, adjusted for the duration of the holding period. We do this as debt levels strongly drive returns, as shown by Engel et al. (2012), while we are analyzing the influence of deal pricing, independent of leverage levels. On a company-specific level we control for sales and margin levels at entry as well as for the change in both during the holding period. By doing so, we are ensuring operating improvements in the portfolio company do not distort our analyses. On a GP level we control for fund size and age of the PE firm at deal entry. Both represent measures for reputation and experience of a GP. We do not control for fund generation, as the influence is very similar to that of GP age. With new fundraising starting usually about every five years, fund generation and GP age develop mostly in parallel, something we also see when conducting robustness tests. Thus, we leave out fund generation as a control variable.

The PE market underlies certain cycles, as shown in Acharya et al. (2007). By controlling for entry year of the individual transaction, we are able to capture these cycles, which are characteristic for the PE market. Furthermore, we control for the region of the individual

investment as well as for the industry, as both of these characteristics strongly distinguish market segments within the PE industry.[46]

2.2.2 Results

2.2.2.1 Entry and Exit Pricing

Figure 2-8 shows the development of entry EV/EBITDA pricing and multiple expansion in our sample of transactions. Naturally, in the later years, the sample contains less transactions as data on these deals is not yet widely available. First, we find that the median EV/EBITDA at entry has been between 5x and 8x EBITDA from the mid-1980s to the late 2000s. The second line shows the median EV/EBITDA exit multiples of deals invested in the corresponding year, irrespective of the final exit year. From the difference between the lines we can thus read the multiple expansion from entry to exit for all deals invested in in the respective year. We can clearly see that in almost all years the transactions achieved an increase from entry to exit multiple. Overall it seems that the lines converge over time, i.e., that multiple expansion from entry to exit has declined.

[46] We do not include a variable capturing the intensity of competition in the market. We tested the results with a competition variable based on PE fundraising activity from Thomson and did not find significant differences when including competition in our analyses, as the same effect is captured by controlling for entry year of the transaction.

Figure 2-8: Entry Pricing and Multiple Expansion

This figure shows the number of entries per year. The gray line displays the median entry EV/EBITDA multiples of all entries of the respective year. The black line shows the median exit EV/EBITDA multiples associated with the deals entered in the respective entry year, i.e., the difference between the gray and the black line shows the difference between median entry and exit multiples by entry year.

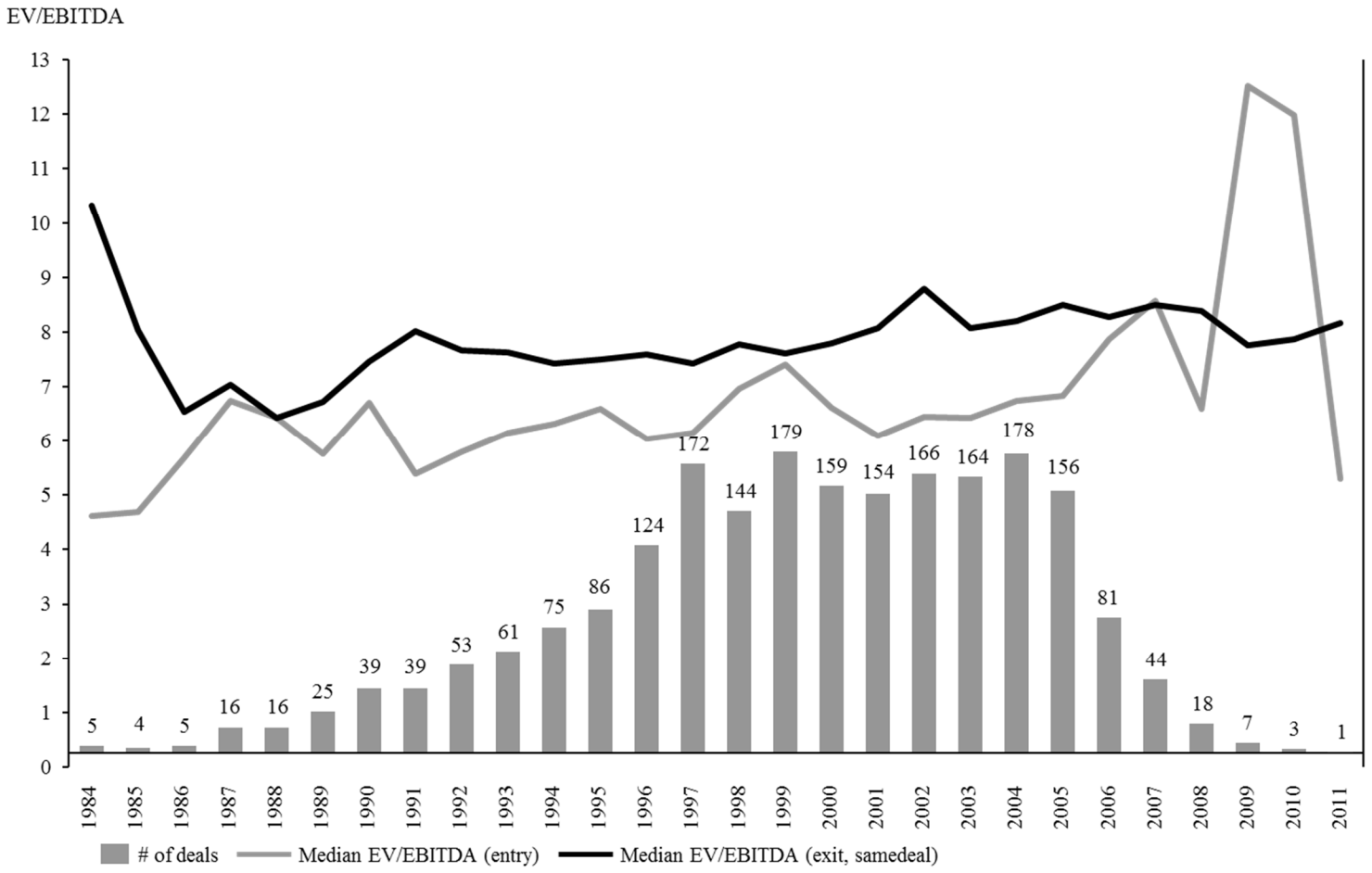
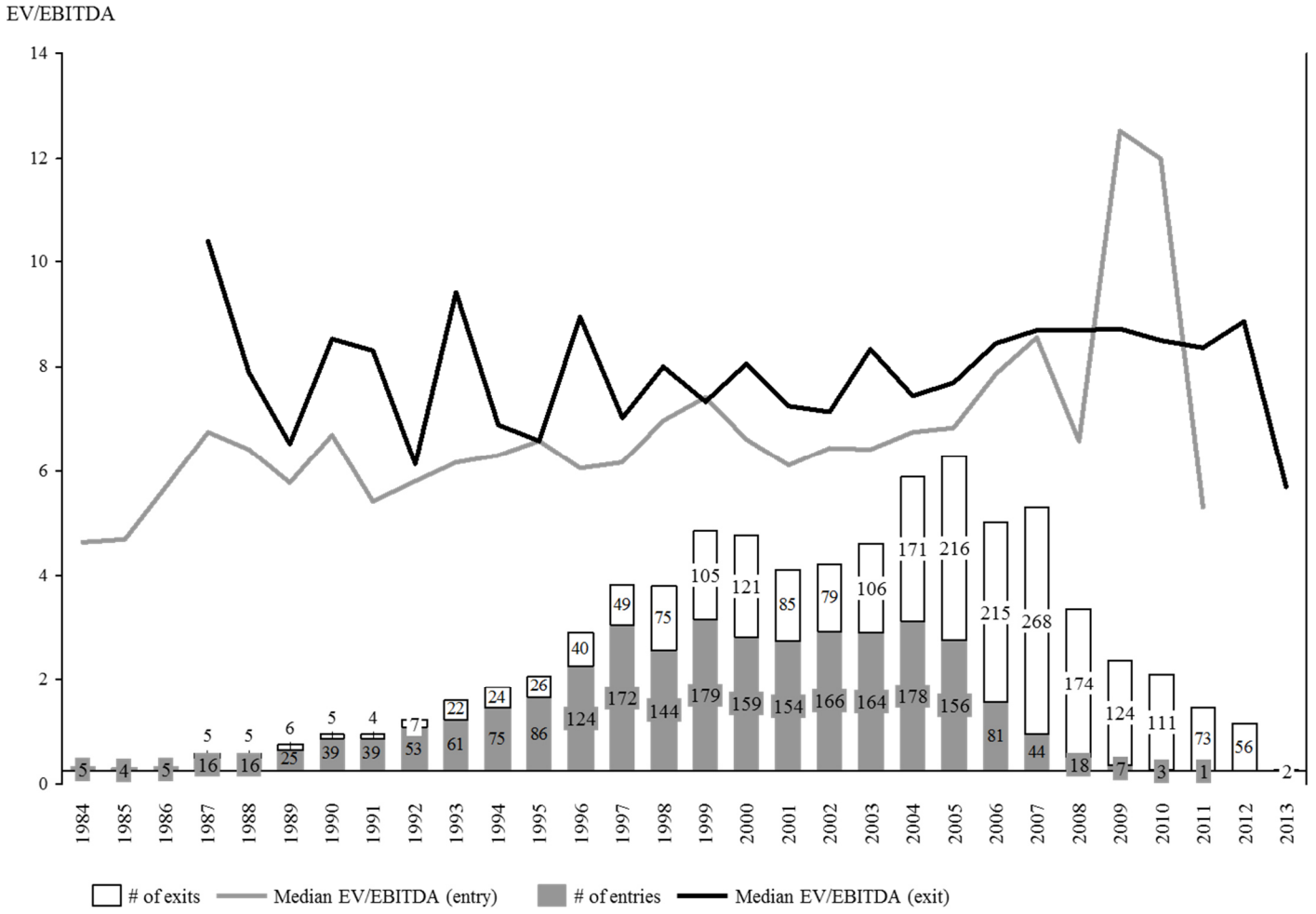


Figure 2-9 presents median entry and exit pricing for the respective years. First, we see the same entry pricing as in Figure 2-8. The second line shows the pricing of those deals exited in the respective years. We find that entry and exit pricing over time have stayed very close together in their values. The higher variations in exit pricing during the 1990s is due to the fewer number of exits in those years.

Figure 2-9: Entry and Exit Pricing

This figure shows the number of entries and exits per year. The gray line displays the median entry EV/EBITDA multiples of all entries of the respective year. The black line shows the median exit EV/EBITDA multiples by exit year. The figure thus shows the difference between prices for entries and for exits in a certain year.



2.2.2.2 Deal Performance and EV/EBITDA Multiple Expansion

Table 2-12 shows the relationship of deal returns, measured in IRR, and multiple expansion. In all specifications we control for entry year, region, and industry of the deal, which are the same variables we also use in defining the market segment for the relative pricing comparison. We find that there is a significant relationship between multiple expansion and IRR. This effect remains significant, and becomes stronger when we control for more variables. The controls with the most significant influence on deal returns are EV/EBITDA multiple expansion, debt/equity at entry, debt/equity change during the holding period, debt/EBITDA at entry, EBTDA margin at entry, as well as sales and EBITDA margin change. The change in the coefficient of multiple expansion from specification (2) to (3) stems mainly from controlling for sales and EBITDA margin at entry, and their change during the holding period. Controlling for GP and fund characteristics when moving to model (4) impacts the coefficients slightly. For each percentage point increase in multiple expansion, IRR increases by 0.23 percentage points. Specification (5) shows that the influence is also seen when using absolute EV/EBITDA multiple expansion as an independent variable, instead of relative EV/EBITDA multiple expansion. Only EBITDA margin at entry incurs a drop in significance from 5% to 10%. Thus, we can clearly see that, following Achleitner et al. (2011), multiple expansion does indeed strongly influence deal returns. In addition to this finding, we are able to particularly quantify the effect of entry and exit pricing on EBITDA multiple expansion.

Table 2-12: Deal Performance and Multiple Expansion

This table shows the results of OLS regressions with the dependent variable IRR. The independent variables include relative multiple expansion and the entry multiple. A second set includes deal characteristics such as EV at entry (USD m), debt/equity and debt/EBITDA at entry, change in debt/equity during the holding period, sales (USD m) and EBITDA margin at entry, relative change in sales and in margin during the holding period. The third set includes GP and fund characteristics, namely fund size (USD m) and GP age (years) at deal entry. We control for deal entry year, region and industry. Variables labeled "W1" are winsorized at the 1% level. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	IRR (W1)	IRR (W1)	IRR (W1)	IRR (W1)	IRR (W1)
Relative multiple expansion (W1)	0.1470***	0.1392***	0.2141***	0.2305***	
	(0.0267)	(0.0277)	(0.0392)	(0.0446)	
Entry multiple (W1)		-0.0059*	-0.0110	-0.0101	0.0081
		(0.0031)	(0.0075)	(0.0073)	(0.0079)
Absolute multiple expansion (W1)					0.0407***
					(0.0070)
Deal characteristics					
log(EV at entry)			-0.0194	0.0080	-0.1046*
			(0.0593)	(0.0680)	(0.0619)
Debt/Equity at entry (W1)			0.0480***	0.0481***	0.0519***
			(0.0146)	(0.0153)	(0.0152)
Debt/EBITDA at entry (W1)			-0.0212*	-0.0315***	-0.0385***
			(0.0121)	(0.0116)	(0.0118)
Delta Debt/Equity (W1)			-0.5094***	-0.5809***	-0.5702***
			(0.0909)	(0.1047)	(0.1040)
log(Sales)			0.0418	0.0288	0.1346**
			(0.0584)	(0.0627)	(0.0572)
EBITDA margin at entry (W1)			0.8101**	0.6746*	1.1482***
			(0.3348)	(0.3472)	(0.3279)
Delta Sales (W1)			0.9125***	1.0329***	1.0878***
			(0.1597)	(0.1696)	(0.1707)
Delta EBITDA margin (W1)			2.4285***	2.5815***	2.6519***
			(0.2872)	(0.3052)	(0.3099)
GP/Fund characteristics					
log(Fund size)				-0.0228	-0.0155
				(0.0305)	(0.0300)
GP age				0.0035	0.0024
				(0.0033)	(0.0033)
ENTRY YEAR	YES	YES	YES	YES	YES
REGION	YES	YES	YES	YES	YES
INDUSTRY	YES	YES	YES	YES	YES
Constant	0.2678	0.3050	0.0305	0.1276	-0.0692
	(0.3139)	(0.3136)	(0.1581)	(0.2072)	(0.2067)
Observations	2,174	2,174	1,588	1,377	1,377
R-squared	0.0993	0.1006	0.3070	0.3375	0.3427

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

2.2.2.3 EV/EBITDA Multiple Expansion and Market Pricing Levels

Table 2-13 presents our results when regressing multiple expansion on market price levels at deal entry and exit. As shown in models (1) and (2), the change in effect size of the entry market price levels changes only slightly when additionally controlling for exit pricing. Additionally, both effects are significant at the 1% level, and in the expected direction when controlling for entry year, region, and industry of the respective transactions. When adding deal characteristics in model (3), both effects still remain significant, although entry pricing drops slightly in significance from 1% to 5%. In economic terms, the coefficient for exit pricing stays mostly constant, while entry pricing is reduced to about one third. This change is owing to the fact that most deal-level controls and deal characteristics are captured at transaction entry. When also including GP and fund characteristics in model (4), the coefficients hardly change, showing the robustness of the findings to PE firm specifics. For each EV/EBITDA point that market prices at entry and at exit increase, relative multiple expansion decreases by one percentage point and increases by five percentage points, respectively. As seen in specification (5), the same holds true for absolute multiple expansion. Similarly, prices at exit influence absolute multiple expansion about 2.5-3 times as much as prices at entry. These results show that market price levels at entry and at exit of a transaction significantly influence multiple expansion, a strong sign that market prices influence pricing of the individual deal. Furthermore, we find that price levels at deal exit correlate with EV/EBITDA multiple expansion more than price levels at deal entry, more than four times as much.

Table 2-13: Multiple Expansion and Market Price Levels

This table shows the results of OLS regressions with the dependent variable relative multiple expansion. The independent variables include the market price level at entry and at exit of the respective market segment for each deal. A second set includes deal characteristics such as EV at entry (USD m), debt/equity and debt/EBITDA at entry, change in debt/equity during the holding period, sales (USD m) and EBITDA margin at entry, relative change in sales and in margin during the holding period. The third set includes GP and fund characteristics, namely fund size (USD m) and GP age (years) at deal entry. We control for deal entry year, region and industry. Variables labeled "W1" are winsorized at the 1% level. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
	Relative multiple expansion	Relative multiple expansion	Relative multiple expansion	Relative multiple expansion	Absolute multiple expansion
VARIABLES	(W1)	(W1)	(W1)	(W1)	(W1)
EV/EBITDA market at entry (W1)	-0.0285***	-0.0326***	-0.0095**	-0.0089**	-0.1254**
	(0.0048)	(0.0048)	(0.0039)	(0.0040)	(0.0525)
EV/EBITDA market at exit (W1)		0.0580***	0.0436***	0.0452***	0.3079***
		(0.0096)	(0.0103)	(0.0112)	(0.0636)
Deal characteristics					
log(EV at entry)			-0.4366***	-0.4403***	-1.0634**
			(0.0853)	(0.0981)	(0.5197)
Debt/Equity at entry (W1)			-0.0165	-0.0103	0.0062
			(0.0101)	(0.0108)	(0.0655)
Debt/EBITDA at entry (W1)			-0.0312***	-0.0361***	-0.4885***
			(0.0117)	(0.0128)	(0.1596)
Delta Debt/Equity (W1)			-0.2359***	-0.2644**	-2.5963***
			(0.0891)	(0.1065)	(0.6292)
log(Sales)			0.3944***	0.3834***	1.0090**
			(0.0876)	(0.0971)	(0.5111)
EBITDA margin at entry (W1)			1.6483***	1.5585***	4.0641
			(0.4518)	(0.4960)	(2.5007)
Delta Sales (W1)			-0.0730	-0.1978	-3.4990**
			(0.2110)	(0.2324)	(1.3765)
Delta EBITDA margin (W1)			-1.9119***	-2.1286***	-15.9552***
			(0.3206)	(0.3498)	(2.1907)
GP/Fund characteristics					
log(Fund size)				0.0240	0.0541
				(0.0273)	(0.1546)
GP age				0.0058*	0.0559***
				(0.0030)	(0.0198)
ENTRY YEAR	YES	YES	YES	YES	YES
REGION	YES	YES	YES	YES	YES
INDUSTRY	YES	YES	YES	YES	YES
Constant	0.8699***	0.3680	-0.0698	-0.2009	-0.1703
	(0.3259)	(0.3653)	(0.2008)	(0.2553)	(1.4703)
Observations	2,096	2,096	1,562	1,352	1,352
R-squared	0.0427	0.1148	0.2725	0.2930	0.3631

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

2.2.2.4 EV/EBITDA Multiple Expansion and Relative Pricing

The next step is to understand the relationship between entry pricing compared to market price levels and multiple expansion. Table 2-14 shows this relation. As explained in the methodology section, we relate entry and exit EV/EBITDA pricing of each transaction to the market pricing level in its segment, and during the same nine-month time window. The GP entry and exit skill variables capture the under- (entry) and overpricing (exit) compared to the market. A positive effect means entry pricing below and exit pricing above current market levels, something each GP should want to achieve. Models (1) and (2) show that both entry and exit skills do not change much, and remain significant when taking into account market development. We control for entry year, region, and industry, as in the previous regressions. When moving to model (3), adding deal characteristics, we see the coefficient of entry skills drop by 0.4 percentage points or one third, but remaining significant. This is – as in Table 2-13 – due to the fact that we're adding mostly variables characterizing the deal at entry. When further controlling for GP and fund characteristics in model (4), the coefficients remain fairly robust. We find that entry skills are about twice as important as exit skills for total multiple expansion, and that market development is the least important of the three effects. When a deal at entry is priced one percentage point below current market price, multiple expansion increases by 0.8 percentage points. When pricing is one percentage point above the market at exit, multiple expansion increases by 1.6 percentage points. It thus pays to try to achieve higher exit multiples as they influence multiple expansion disproportionately. All effects are significant at the 1% level, strongly indicating that EV/EBITDA multiple expansion is indeed strongly related to relative deal pricing. In model (5) we conduct a robustness check, namely excluding deals where entry and exit EV/EBITDA multiples are extraordinarily high, as well as those where the market segment for comparison contained only few transactions. We find that the results are

very similar in magnitude and in relation to each other to the ones presented before, proving that our findings are robust. In model (6) we regress IRR on the variables as before and find the same patterns for GP skills: the coefficient for exit skills is about twice as high as that for entry skills. Thus, we can see that the GP skills influence deal returns as they influence multiple expansion in their weight in relation to each other.

Specifications (7)-(10) serve as further robustness checks, using absolute instead of relative GP skills and market development as independent variables. This means that we do not measure GP skills and market development in a relative change compared to the level at deal entry, but instead use the difference in EV/EBITDA-points, thus an absolute difference in valuation. In models (7) and (8), we find robust results to those of relative GP skills, without and including GP and fund characteristics. Both entry and exit skills are significant and the underlying relation – exit skills having a stronger influence than entry skills – holds true. In model (9) we test for the same subsample without outliers as in model (5) and again find significant effects and still exit skills influencing multiple expansion stronger than entry skills. In model (10), we test for the influence on deal returns, i.e., IRR. Again, we find significant influence of absolute GP entry and exit skill as well as market development. Also, GP exit skills show a 25% higher coefficient than entry skills.

Table 2-14: Multiple Expansion and Relative Deal Pricing

This table shows the results of OLS regressions. The dependent variable in models (1)-(5) is relative multiple expansion, in models (7)-(9) absolute multiple expansion and in models (6) and (10) it is IRR. The independent variables includes relative entry and exit skills and market development. Additionally, absolute entry and exit skills and market development are included. A second set includes deal characteristics such as EV at entry (USD m), debt/equity and debt/EBITDA at entry, change in debt/equity during the holding period, sales (USD m) and EBITDA margin at entry, relative change in sales and in margin during the holding period. The third set includes GP and fund characteristics, namely fund size (USD m) and GP age (years) at deal entry. We control for deal entry year, region and industry. Variables labeled "W1" are winsorized at the 1% level. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Rel. multiple exp. (W1)	Rel. multiple exp. (W1)	Rel. multiple exp. (W1)	Rel. multiple exp. (W1)	Rel. multiple exp. (W1)	IRR (W1)
Relative GP entry skills (W1)	1.0505***	1.2653***	0.8455***	0.8028***	0.7886***	0.2918***
	(0.0630)	(0.0715)	(0.0801)	(0.0856)	(0.0812)	(0.0838)
Relative GP exit skills (W1)	1.3923***	1.6456***	1.6339***	1.6658***	1.2562***	0.5300***
	(0.0783)	(0.0668)	(0.0852)	(0.0987)	(0.0904)	(0.0761)
Relative market dev. (W1)		0.8137***	0.6847***	0.6820***	0.3879***	0.2146***
		(0.0540)	(0.0599)	(0.0648)	(0.0451)	(0.0437)
Deal characteristics						
log(EV at entry)			-0.3708***	-0.3742***	-0.3570***	-0.0912
			(0.0755)	(0.0874)	(0.0593)	(0.0624)
Debt/Equity at entry (W1)			-0.0004	0.0028	0.0085	0.0488***
			(0.0066)	(0.0071)	(0.0071)	(0.0152)
Debt/EBITDA at entry (W1)			-0.0027	-0.0081	-0.0386***	-0.0410***
			(0.0128)	(0.0148)	(0.0123)	(0.0104)
Delta Debt/Equity (W1)			0.0303	0.0336	-0.0604*	-0.5751***
			(0.0535)	(0.0639)	(0.0357)	(0.1058)
log(Sales)			0.3405***	0.3406***	0.3576***	0.1312**
			(0.0784)	(0.0875)	(0.0577)	(0.0557)
EBITDA margin at entry (W1)			1.4523***	1.4455***	1.9161***	1.0932***
			(0.4166)	(0.4623)	(0.3026)	(0.3174)
Delta Sales (W1)			-0.0968	-0.1625	-0.2954***	1.0019***
			(0.1316)	(0.1571)	(0.0894)	(0.1618)
Delta EBITDA margin (W1)			-0.5473***	-0.5841***	-0.1811	2.5505***
			(0.1800)	(0.2079)	(0.1190)	(0.3130)
GP/Fund characteristics						
log(Fund size)				0.0212	0.0241	-0.0172
				(0.0188)	(0.0150)	(0.0311)
GP age				-0.0015	-0.0004	0.0020
				(0.0020)	(0.0017)	(0.0033)
ENTRY YEAR	YES	YES	YES	YES	YES	YES
REGION	YES	YES	YES	YES	YES	YES
INDUSTRY	YES	YES	YES	YES	YES	YES
Constant	0.5696***	0.0533	-0.1058	-0.1905	-0.3222**	-0.0110
	(0.1639)	(0.0523)	(0.1304)	(0.1788)	(0.1614)	(0.1873)
Observations	2,096	2,096	1,562	1,352	788	1,352
R-squared	0.4012	0.6423	0.7016	0.6923	0.6880	0.3323

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

VARIABLES	(7) Absolute multiple expansion (W1)	(8) Absolute multiple expansion (W1)	(9) Absolute multiple expansion (W1)	(10) IRR (W1)
Absolute GP entry skills (W1)	0.8762***	0.8634***	0.8417***	0.0313***
	(0.0486)	(0.0527)	(0.0335)	(0.0075)
Absolute GP exit skills (W1)	1.0071***	1.0053***	0.9421***	0.0462***
	(0.0313)	(0.0351)	(0.0158)	(0.0078)
Absolute market development (W1)	0.8317***	0.8241***	0.8011***	0.0367***
	(0.0330)	(0.0362)	(0.0313)	(0.0067)
Deal characteristics				
log(EV at entry)	-0.1529	-0.1507	-0.0938	-0.0923
	(0.2179)	(0.2397)	(0.0934)	(0.0587)
Debt/Equity at entry (W1)	-0.0171	-0.0140	0.0341***	0.0456***
	(0.0279)	(0.0308)	(0.0117)	(0.0148)
Debt/EBITDA at entry (W1)	0.1257	0.1079	-0.0977***	-0.0306***
	(0.0984)	(0.1096)	(0.0309)	(0.0112)
Delta Debt/Equity (W1)	-0.1830	-0.2618	-0.2909***	-0.5845***
	(0.1617)	(0.1932)	(0.0873)	(0.1045)
log(Sales)	0.0121	0.0068	0.1081	0.1203**
	(0.2170)	(0.2414)	(0.0935)	(0.0537)
EBITDA margin at entry (W1)	-0.5487	-0.5667	0.5842	1.0410***
	(0.9904)	(1.1054)	(0.4710)	(0.3120)
Delta Sales (W1)	0.3300	-0.0190	-0.4988***	1.1331***
	(0.4629)	(0.4665)	(0.1737)	(0.1654)
Delta EBITDA margin (W1)	-1.6184***	-2.0180***	-1.1163***	2.6333***
	(0.5942)	(0.6238)	(0.3103)	(0.3128)
GP/Fund characteristics				
log(Fund size)		-0.0373	0.0735**	-0.0214
		(0.0505)	(0.0308)	(0.0301)
GP age		0.0023	-0.0020	0.0020
		(0.0063)	(0.0045)	(0.0033)
ENTRY YEAR	YES	YES	YES	YES
REGION	YES	YES	YES	YES
INDUSTRY	YES	YES	YES	YES
Constant	0.2953	0.6350	-0.1470	0.0461
	(0.5461)	(0.5382)	(0.1709)	(0.1864)
Observations	1,562	1,352	788	1,352
R-squared	0.9279	0.9237	0.9286	0.3389

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

2.2.3 Discussion of results

Our results show that multiple expansion is an important factor in explaining deal returns. We find that multiple expansion does indeed positively and significantly influence the internal rate of return (IRR). For each percentage point increase in EV/EBITDA valuation between entry and exit, IRR increases by 0.23 percentage points. Next, we find that the level of multiple expansion achieved in PE transactions is influenced by prevailing market price levels both at deal entry and exit. Specifically, we find that price levels at the time of the exit influence deal multiple expansion over four times as much as price levels at deal entry. Last, we combine these analyses and find that achieving a favorable relative pricing at entry and at exit positively influences multiple expansion and deal returns. We find that buying one percentage point below market prices increases multiple expansion by 0.8 percentage points. On the other hand, selling one percentage point above market prices increases multiple expansion by 1.7 percentage points, i.e. disproportionately. This shows two things: First, selling above the market has a greater effect on multiple expansion than buying below the market. Second, focusing on achieving a good exit, in comparison to market pricing, does more than pay off in terms of multiple expansion. When taking these results further, we find that each percentage point of entry (exit) pricing below (above) the market yields and increase in IRR of 0.3 percentage points (0.5 percentage points).

As our results show, EBITDA multiple expansion and – as the driver for it – deal pricing at entry and exit are also key drivers for deal returns. As our findings suggest, being able to achieve deal pricing below or above market prices at entry and at exit, respectively, positively influences multiple expansion and thus deal returns. When structuring a transaction, many GPs assume entry and exit multiples to be equal. However, achieving higher multiple expansion delivers real improvements in deal returns. It is thus not something that is nice to have, but an

important factor in achieving the returns GPs promise their investors. We interpret our results as evidence for the importance of "buying low and selling high" in PE, with an emphasis on selling high. We expect that it is possible to develop a distinct skillset that allows for profiting from such pricing behavior.

There is a lively discussion ongoing about whether there is still performance persistence in PE.[47] Within this stream of research there is also the question raised of whether certain skills of GPs help in keeping performance persistently high. There seems to be some evidence for skills among GPs, although clearly measuring and especially identifying them is difficult. The difficulty for LPs is in finding these skilled GPs. A skillset as described above, enabling GPs to increase their returns through paying favorable prices may help LPs identify skilled GPs.

Our findings show that within the PE industry there are indeed skills that at least some GPs possess. Our results help GPs and LPs understand the sources of deal performance, which is what ultimately drives fund performance. For GPs, our results show that pricing negotiations are something worth investing time and energy in. The results also show that sometimes, however, insisting on a certain price may not be of much use, if there are other means of driving deal returns sufficient not to have to worry about EBITDA multiple expansion anymore. In the process of fund selection by LPs there is often discussion about whether a previous fund was top quartile and whether the fund under review may be able to do just as well. Our analyses show there are skills present within the GPs, however, they may or may not show in the form of fund top quartile performance. For LPs, this means that when deciding about funds to invest in a closer look at the actual deal making of GPs is advisable, i.e., understanding single

[47] For different opinions on performance persistence in PE, see Kaplan and Schoar (2005), Braun et al. (2016) and Korteweg and Sørensen (2014).

transactions and the behavior and reasons on the level of individual investment and divestment decisions.

2.2.4 Conclusion

Based on a sample of 2,174 private equity transactions we have analyzed deal pricing and its influence on EV/EBITDA multiple expansion and returns. We have compared whether being able to buy below and sell above relevant prices within the same market segment pays off in terms of multiple expansion and ultimately in terms of deal performance. We argue that this relative pricing can be influenced to a certain extent by the GP making the deal.

We find that EV/EBITDA multiple expansion significantly drives deal returns, measured by IRR. Accordingly, we focused on EV/EBITDA multiple expansion as a measure of how strong the influence of actual deal pricing is. We found that multiple expansion is significantly driven by market price levels at the time of deal entry and exit, respectively. Lastly, we find that relative pricing, i.e. EV/EBITDA at entry and at exit in comparison to the relevant prices in the market segment for each deal, significantly influences multiple expansion. Being able to pay less, or receive more, than other transactions in terms of EV/EBITDA at the time of entry and exit pays off in terms of multiple expansion and ultimately in higher deal returns. In more detail, our analyses show that exit pricing is about twice as important as entry pricing, highlighting the need to focus on exit pricing if a choice between entry and exit has to be made.

While one can argue whether and by how much GPs are really able to influence transaction pricing, they undoubtedly do have some influence. As auctioned transaction processes become more common, prices go higher and higher, and discussions with practitioners reveal that proprietary sourcing is what most investors are aiming at. Their main reason is that lower entry prices are usually achieved when compared to an auction.

The key question that arises from our results is, in our view, how GPs are able to achieve favorable pricing. While we argue that there is a certain degree of negotiation success, one could also argue that favorable pricing is rather achieved through an efficient sourcing process. For example, transactions with higher GP entry skills could be those with proprietary sourcing instead of auctioned processes.

Our analyses are helpful for practitioners in that they show the importance of transaction pricing in achieving attractive deal returns. While different GPs will have different approaches to this, and may not want or need to take it into account, we highlight a clear area of focus that can help deliver the returns promised to LPs. Once multiple expansion skills can be linked to specific GP or fund characteristics, this may help explain why some GPs still consistently outperform most of their peers, and thus help LPs in choosing the right funds to invest in.

We see a couple of further questions arising from our results. First, while most research on performance persistence in PE is conducted on a fund level, the GP level is the one where decisions about deals are made. Understanding whether certain GPs are able to achieve favorable pricing more often than others can help LPs invest in the right funds. Whether these GPs are the ones that are experienced, the ones that are young or the ones that manage large funds could reveal different strategies to approach pricing negotiations. A related question is whether for certain GPs the effort necessary to achieve beneficial pricing is worth taking when comparing the effect to the influence of leverage and operating improvements.

Second, there may be transactions that are priced unfavorably but nonetheless deliver good returns. Those deals may be so profitable that the investor is willing and able to pay a higher price. Reasons for this could be because the market is growing at higher rates, the company has a favorable revenue structure, or there are options for financing the deal that more than

compensate the higher price. Similarly, while we did not find patterns that could explain the dynamics of those deals, we propose that there certainly are reasons for a certain price level, even if it is above current market prices.

Lastly, professional investors like GPs can be expected to know their price limit for a certain deal. At least for the entry any GP can influence the price, even if this means foregoing a deal that appears too expensive. Thus, there must be reasons a GP's behavior when entering pricing negotiations. Whether this happens consciously or unconsciously remains up to further research.

2.3 Essay 3: Private Equity Minority Investments

Abstract

In the maturing Private Equity industry, investments where the Private Equity fund owns a minority of the equity – as a different form of investment – are gaining influence. Those minority investments use different instruments for value creation than classic majority investments and involve other mechanisms of decision-making from both minority and majority shareholders. Therefore, understanding value creation in minority investments on a deal-level is important for understanding this different type of investment. We conduct one of the first empirical analyses about return metrics and apply a common framework to identify and compare the sources of value creation for both types of investments. We thus contribute to an initial understanding of Private Equity minority investments and shed light on this evolving type of investment.

We find that overall returns of minority investments are below those of majority investments. The same holds true for the individual value creation drivers, namely the leverage effect, multiple expansion, free cash flow and EBITDA growth. Therefore, within minority investments there seem to be other mechanisms at play for creating returns for the investor, otherwise their increasing share within the Private Equity industry would be difficult to explain. When comparing risk-adjusted returns of minority and majority investments, though, we find considerably higher Sharpe-Ratios for the performance measures Money Multiple and Times Money in minorities. Minority investments thus appear to offer a different type of risk-return relationship to broaden diversification for both general and limited partners. Hence, they reflect the mature Private Equity industry by offering other than the familiar high-risk-high-return relationship.

Keywords: Private Equity, Value Creation, Leveraged Buyouts, Minorites

JEL Classification Code: G23, G24, G31, G32, G34

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2.3.1 Introduction

Since the late 1970s, Private Equity (PE), namely leveraged buyouts, has evolved into a multi-billion-dollar business supporting growth of several industries. As the PE industry itself is ageing, it is also becoming increasingly mature. This maturity is characterized by growing amounts of money invested, a growing number of participants, increasing experience of the participants and a higher acceptance of PE as an asset class. One consequence of this increasing maturity is the evolution of other forms of investments than the classic one-majority-GP-one-target deals as competition within the PE market grows. Other forms such as club deals, direct investments by limited partners (LPs), and minority investments (MIN) have evolved. Club deals, i.e., joint investments by more than one PE firm in one portfolio company, have been covered in research to some extent already (see Marquez and Singh (2013), Boone and Mulherin (2011), and Officer et al. (2010)). Direct investments by LPs are differing mainly by who invests as the selection of the target firms is still usually done by the GP, and the LPs invest based on their judgment of the GPs' ability to make a good pick (Fang et al. (2015)).

MIN, where one general partner (GP) invests in a minority share of a portfolio company, usually joining a non-financial majority shareholder, are an up-and-coming investment form in PE. A recent article from The Boston Consulting Group (BCG) on a number of large-cap PE funds confirms the rise of MIN: The share of MIN of all buyouts has increased from 13% in 2004 to 27% in 2007 (Schneider and Henrik (2015)). We interpret this increase in MIN as a consequence of the maturing PE industry.

PE MIN are on the rise because they offer investment opportunities that would not have been available to a majority investment (MAJ) otherwise ("better a minority investment than no investment"). Though there is substantial research on value creation in PE MAJ (see

Achleitner et al. (2010), Achleitner et al. (2011), Puche et al. (2015), and Acharya et al. (2013)), academic literature on PE MIN is scarce. Most of it has focused either on an individual characterization of PE MIN (Tappeiner et al. (2012) and Söding (2012)) or on comparing PE MIN with non-PE MIN (see Chen et al. (2014) and Jensen (1986)). To our knowledge, as of today there is only one paper by Battistin et al. (2013), comparing the value creation components of PE MIN and MAJ. They compare PE portfolio companies with a non-PE control group and find that growth in revenue, employment, and profitability is higher after PE invested. They also find that this effect is even higher for MIN than for MAJ.

PE majority ownership allows the realization of familiar PE value creation potentials, i.e., through highly levered financing, operational efficiency improvements (e.g., cost cutting or replacement of management teams), and multiple expansion (e.g., optimization of exit timing or growing into a higher multiple "class"). In a MIN, since the GP does not own a controlling interest, the possibilities for actively influencing company development and decisions based on ownership share are limited, and could therefore impact returns. Kaplan and Strömberg (2009) argue that owing to their operational engineering capabilities GPs should be able to support their portfolio companies and this could also be true for minority investments (Lichtenberg and Siegel (1990) argument in a similar direction, showing higher operational efficiency gains when a PE investor is involved). Still, the question remains of how to provide this support without holding majority ownership.

In this paper, we investigate PE MIN as an evolving form of PE investment. To our knowledge, there is no research available as of today that analyzes PE MIN versus MAJ on a deal-level, i.e., the transactions from the view of the investor from entry to exit. Based on this data we calculate returns and value creation in MIN and analyze and explain the differences to MAJ. The group for comparison comprises classic PE MAJ as this is what most GPs still do

and where most LPs focus their investments on. Our analysis helps understand the MIN landscape and sources of value creation.

With this paper, we thus provide an initial understanding of the MIN landscape from an investor's point of view. We are able to provide possible reasons for differences in PE performance and for different sources of value creation in MIN compared to MAJ. We aim at laying a foundation with opening MIN as a distinct research topic, therefore we are keeping our analyses in a univariate manner. As there needs to be a common base established when talking about MIN compared to MAJ we stick with a known methodology used to analyze sources of value creation, as presented in Achleitner et al. (2010).

We find that MIN deliver significantly lower returns than MAJ. This is true for the public market equivalent (PME), Money Multiple (MM) and Times Money (TM), while the internal rate of return (IRR) is at the same level, owing to the longer holding period of MAJ. Our results show lower value creation in MIN in all value creation effects. When comparing the relative contribution of the individual effects, MIN gain more of their EBITDA improvement from sales growth and less from margin improvements than MAJ. This is in line with what we expected, as a minority investor's influence is limited compared to a majority investor's influence. The investor is therefore not able to finance the transaction with as much debt as usual in PE. Additionally, control over the operating business is limited in MIN, which, in our understanding, is why margin improvements are higher where a majority is held by a PE sponsor. The advantage MIN have, though, is a better risk-return ratio, i.e., they are able to achieve higher returns in comparison to the risk incurred.

Whether minority investors pick other target firms or simply are not able to take as much influence, we see that MIN deliver lower returns than MAJ. However, the higher returns of

MAJ in turn come with a disproportionately higher risk. This makes MIN an attractive choice for more risk-averse PE investors or for investors willing to reduce overall portfolio risk by blending in MIN risk structure. Lastly, the lack of exerting formal influence in MIN through ownership, is in practice likely offset by legal agreements or other instruments, such as drag-along and tag-along rights for the minority shareholder.

2.3.2 Data

The dataset we use for our analyses comprises 920 unique PE transactions.[48] We obtained this sample from three large institutional investors who invest in PE funds serving as LPs. In the course of their due diligence on funds to invest in, these LPs receive a detailed track record of all past investments of the GPs who seek funding. The data comprises deal-specific information about the country, region, and industry of the investment targets as well as monthly gross cash flows between the portfolio companies and the funds. Additionally, we have obtained value creation data, i.e., enterprise value (EV), debt and equity portion, sales, and EBITDA both at investment entry and exit.

The sample contains only fully realized transactions, we excluded all unrealized and only partially realized deals. Furthermore, we compiled MIN and MAJ subsamples based on the GPs' equity ownership: investments where the PE firm owns less than 50 percent of the equity were classified as MIN, investments where the PE firms' equity stakes equals 50 percent or more were classified as MAJ. Club deals were treated as MAJ, as the GPs invested usually hold

[48] Our sample is a subsample of the sample used in Puche et al. (2015), limited to those transactions where ownership could be clearly separated into minority or majority holdings.

a majority of the equity when combined. We assumed that PE investors have very similar, if not the same, incentives and therefore classified these deals as MAJ.

Table 2-15 shows descriptive statistics for our sample. The sample contains a total of 920 unique transactions, thereof 96 MIN and 824 MAJ. The time period covered by the MIN and MAJ groups are about the same, ranging from the late 1980s until 2013. Mean entry and exit years are approximately equal in MIN and MAJ. MAJ deals are on average held for 5.0 years versus 4.6 years compared to MIN. The ownership structure reflects the definition of our subsamples, with a mean 32% for MIN and 58% for MAJ. The EV, revenue, and EBITDA figures show that investment targets of MIN were slightly larger than those of MAJ. The entry and exit transaction-multiples of MIN and MAJ are at about the same level of 7.8 and 7.9 (entry) versus 10.2 and 10.1 (exit). A clear difference exists in the amount of debt used to finance the transactions, where MAJ display an average debt/equity ratio of 2.2 compared to 1.3 for MIN.

Table 2-15: Sample Descriptives

This table presents sample descriptives for the MIN and MAJ subsamples. The figures shown include minimum, maximum, mean, median, and standard deviation for the most important metrics. The sample contains 96 MIN and 824 MAJ.

	Minimum		Maximum		Mean		Median		Standard deviation	
	MIN	MAJ	MIN	MAJ	MIN	MAJ	MIN	MAJ	MIN	MAJ
Entry year	1990	1988	2008	2010	2002	2001	2003	2002	3.1	4.1
Exit year	1999	1991	2012	2013	2007	2006	2007	2006	2.8	4.0
Holding period [years]	0.7	0.5	14.2	14.3	4.6	5.0	4.0	4.7	2.7	2.4
Ownership at entry	10%	10%	50%	100%	32%	58%	34%	60%	13%	32%
EV at entry [USD m]	6	2	6,033	11,576	450	401	108	128	1,056	857
EV et exit [USD m]	10	4	7,898	18,142	786	821	246	280	1,411	1,693
Sales at entry [USD m]	3	0	13,615	10,849	465	375	74	123	1,723	829
Sales at exit [USD m]	6	2	28,381	34,991	677	597	138	194	2,940	1,690
EBITDA at entry [USD m]	0	0	1,015	2,205	62	55	15	18	157	128
EBITDA at exit [USD m]	1	0	1,009	3,611	89	93	24	30	181	217
EV/EBITDA at entry	2.2	2.0	26.8	285.5	7.8	7.9	6.9	6.8	3.9	10.6
EV/EBITDA at exit	3.1	2.3	27.4	228.4	10.2	10.1	9.2	8.6	4.5	11.8
Debt/Equity at entry	0.0	0.0	7.1	53.0	1.3	2.2	0.8	1.6	1.3	2.8
Debt/Equity at exit	0.0	0.0	129.6	180.4	2.7	1.4	0.3	0.4	15.7	8.3

2.3.3 Methodology

Based on the cash flow data we obtained in our sample, we are able to calculate the return measures IRR, MM, and PME. Based on the detailed value creation data on transaction level, we can further calculate the TM, transaction-multiples, and EBITDA margins for all transactions within our sample.

We compare PE MIN and MAJ in three perspectives: (1) returns, (2) sources of value creation, and (3) volatility of returns. Returns (1) are measured with the classic PE metrics IRR, MM, PME, and TM. We analyze the sources of value creation (2) based on the common framework used by Loos (2006), Pindur (2007), Achleitner et al. (2010), and Puche et al. (2015). Therefore, we define value creation as the net capital gain to investors, compared to the invested capital. The capital gain comprises of the change in equity from entry to exit, capital injections into the company, and dividends received. Net capital gain is related to the invested capital, which contains equity invested at entry and capital injections during the holding period. The net capital gain is expressed as a multiple of the invested capital and thus called TM, expressing the return as a multiple of the amount invested. Hence, it is a normalized measure that can be used to compare value creation between transactions of different sizes. To investigate the sources of value creation we further split the TM into the following components: leverage, EBITDA, transaction-multiple, free cash flow (FCF), and a combination effect consisting of EBITDA/multiple residuals.[49] Moreover, the EBITDA effect is broken down into sales, margin, and combined sales/margin effects.

[49] For a more detailed description of the value creation breakdown logic see Puche et al. (2015).

The volatility of returns (3) of MIN and MAJ is evaluated by comparing the Sharpe-Ratio (SR) for the return metrics. The SR yields a risk-adjusted return and clarifies whether returns stem from different levels of risk, or from actual differences in returns at the same level of risk (see Sharpe (1966)). An important input of the SR calculation is the assumed risk-free rate of return. For the IRR we assume the average LIBOR for each subsample as the risk-free rate because the IRR is an annualized return figure.[50] For the MM we assume the risk-free rate from the TM SR calculation, as the MM figure represents the total return on the invested capital, and not just the profit, as in the TM. Finally, for the TM, we calculate this rate by compounding the average LIBOR for each subsample (MIN and MAJ) over the respective subsample's average holding period.

2.3.4 Hypotheses

As argued before, minority investors may not be able to implement the classic PE value creation measures owing to the lack of control. Based on our expectations we pose the following hypotheses concerning returns, value creation, and risk-return ratio of MIN and MAJ.

2.3.4.1 Returns

As MIN shareholders do not own a majority of the equity, the possibilities for formally exerting influence, by means of being a majority shareholder, do not apply. Instead, the majority owner is usually non-financial and as such likely has different, or at least less aggressive, demands concerning returns. On his own, a GP may therefore not be able to extract the same

[50] We chose LIBOR as a base in accordance with the calculation of the cost of debt in the value creation. This is in line with Ivashina and Kovner (2011) who base their analysis on the spreads paid over LIBOR.

level of returns as in classic MAJ. We thus expect the returns of MIN to be lower than those of MAJ.

H1: IRR, PME, MM, and TM are lower in MIN than in MAJ.

2.3.4.2 Value Creation

Our sample provides us with the possibility to further evaluate where MIN and MAJ differ in their value creation. Using high levels of debt to finance transactions is a key characteristic of PE investors and drives returns.[51] Non-financial majority owners in PE MIN likely are not as keen on using leverage as the GP would be. We thus expect less use of leverage in MIN and thus a lower importance for value creation.

H2: MIN gain less value creation from leverage than MAJ.

As minority investors know about the limitations implementing operating improvements, we would expect them to pick targets where they can gain more value creation from other levers such as market and therefore sales growth. Since the GP in a MIN cannot fully extract the value of the operating business, we hypothesize a different focus of operational engineering in MIN and MAJ:

H3: MIN gain less value creation from margin expansion than MAJ.

However, we expect MIN to create more value from sales growth as picking targets operating in more dynamic markets does not necessarily require majority control. Therefore, operational value creation through sales growth seems to be easier to predict and achieve than

[51] See Achleitner et al. (2011).

operating improvements, as a non-financial majority owner should also be interested in positioning his investment in a growing market.

H4: MIN gain more value creation from sales growth than MAJ.

We expect the expansion of transaction multiples to be lower in MIN than in MAJ, since the minority investors' exit timing depends on their majority partners' preferences, whereas PE majority investors can influence exit timing themselves. We expect less interested buyers since minority stakes are not interesting for most PE firms or strategic corporations (some funds may even be restricted from investing in minority shares). The exception would be transactions in which also the former majority investor sells his stake and in total a majority participation is offered. We rate this as the exception, though. Therefore, exit multiples should be lower when exiting MIN and this should consequently lead to less multiple expansion in MIN than in MAJ.

H5: MIN gain less value creation from multiple expansion than MAJ.

A similar logic applies to the use of the FCF. We expect minority investors to have less influence on the allocation of FCF, i.e., on the extent of debt repayment or dividend payouts, again owing to their limited formal influence.

H6: MIN gain less value creation from FCF effect than MAJ.

2.3.4.3 Risk and Return

All the above mentioned factors lead to less value creation in MIN. In our opinion, this is a consequence of the limited influence they can exert owing to their minority equity share. Since we expect the performance and value creation in MIN to be lower than that of MAJ, but much less volatile, we would expect a more favorable ratio of risk and return for MIN than for MAJ.

H7: The risk-adjusted return (SR) is higher for MIN than for MAJ.

2.3.5 Results

2.3.5.1 Returns

Table 2-16 shows mean and median values for the return measures for MIN and MAJ samples. We find that the mean IRR of MIN and MAJ are equal, but the median IRR of MIN is slightly lower than that of MAJ. Mean MM, PME, and TM are significantly lower for MIN than for MAJ. Median values are slightly lower, which is, however, not statistically significant. The smaller difference between MIN and MAJ concerning IRR compared to the other return measures may be caused by the longer holding period of MAJ (compare Table 2-15), offsetting the higher values in the other return indicators when taking time into account.

Table 2-16: Return Measures

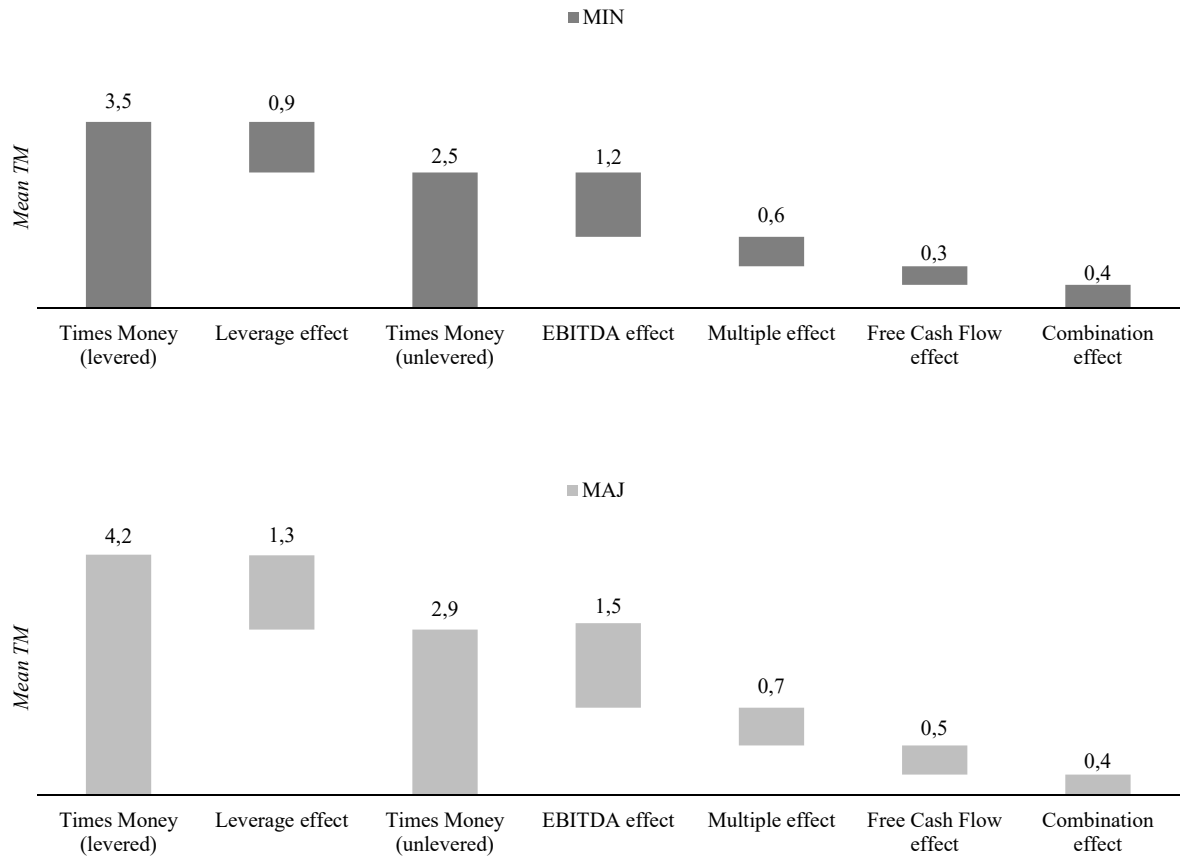
This table presents return measures for MIN and MAJ. The figures shown include means and medians for IRR, MM, PME, and TM. On the right-hand side we show the p values for the one-sided T test and the Mann-Whitney test, used to test for the difference in mean and median values between MIN and MAJ. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Mean			Median		
Variable	MIN	MAJ	T Test (p value)	MIN	MAJ	Mann-Whitney Test (p value)
Observations	96	824	-	96	824	-
IRR	61%	61%	0.96	39%	41%	0.99
MM	3.1	3.7	0.01 ***	2.7	2.9	0.17
PME	2.5	3.0	0.01 ***	2.2	2.3	0.21
TM	3.5	4.2	0.06 *	2.7	2.9	0.34

2.3.5.2 Value Creation

Figure 2-10 presents the value creation breakdown of MIN and MAJ based on mean values for the individual value creation drivers of the MIN and MAJ samples. The mean levered TM is 3.5x and 4.2x for MIN and MAJ, respectively. The leverage effect accounts for 0.9x and 1.3x, yielding an unlevered TM of 2.5x and 2.9x for MIN and MAJ. Value creation from EBITDA improvements amounts to 1.2x and 1.5x for MIN and MAJ whereas the multiple effects are 0.6x and 0.7x. The FCF effects, representing changes in debt as well as capital injections and dividends, amount to 0.3x and 0.5x for MIN and MAJ.

Figure 2-10: Value Creation Drivers of MIN and MAJ



We find that MIN create less value in each of the individual effects compared to MAJ. Table 2-17 shows details for this split of effects, revealing that the differences in mean for levered TM, leverage effect, and EBITDA effect are statistically significant at least at the 10% level. Additionally, we find that the leverage effect for the median differences is significantly lower in MIN at the 5% level.

Table 2-17: Value Creation Drivers

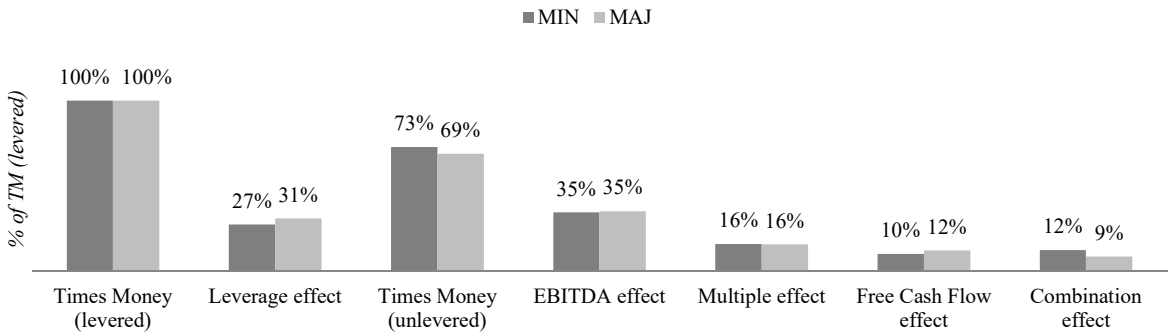
This table presents the value creation drivers for MIN and MAJ. The figures shown include means and medians for levered TM, leverage effect, unlevered TM, as well as the EBITDA, multiple, FCF, and combination EBITDA/multiple effect. On the right side we show p values for the one-sided T test and the Mann-Whitney test, used to test for the difference in mean and median values between MIN and MAJ, respectively. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Mean			Median		
Variable	MIN	MAJ	T Test (p value)	MIN	MAJ	Mann-Whitney Test (p value)
Observations	96	824		96	824	
Times Money (levered)	3.5	4.2	0.06 *	2.7	2.9	0.34
Leverage effect	0.9	1.3	0.01 ***	0.6	0.9	0.03 **
Times Money (unlevered)	2.5	2.9	0.19	1.7	1.9	0.71
EBITDA effect	1.2	1.5	0.09 *	1.1	1.0	0.35
Multiple effect	0.6	0.7	0.23	0.3	0.4	0.74
Free Cash Flow effect	0.3	0.5	0.18	0.2	0.3	0.99
Combination effect	0.4	0.4	0.64	0.2	0.1	0.30

The leverage effect in MIN is lower owing to the less aggressive financing structure at deal entry (mean debt/equity values of 1.3 vs. 2.2 for MIN and MAJ). The EBITDA effect is lower, even though the absolute change in EBITDA is equal, but MIN start from a higher base (compare Table 2-15). The multiple effect is almost equal, as shown in Table 2-15, where both groups start and end on roughly equal EV/EBITDA levels.

Figure 2-11 presents the relative importance of the value creation drivers by displaying shares of the value creation components as part of levered TM. The relative share of the leverage effect is 27% and 31% for MIN and MAJ. The shares of the other value creation drivers are at about equal levels for both MIN and MAJ.

Figure 2-11: Relative Value Creation Composition in MIN and MAJ



When further analyzing the composition of the EBITDA effect, we find that the difference in absolute EBITDA effect is driven by the significantly lower margin expansion in MIN compared to MAJ (see Table 2-18). The sales effect is at about the same level for MIN and MAJ. This could indicate that the sales growth achieved during PE ownership does not necessarily depend on whether the GP owns a majority or a minority stake. Hence, PE minority investors may be able to influence the sales growth just as PE majority investors.

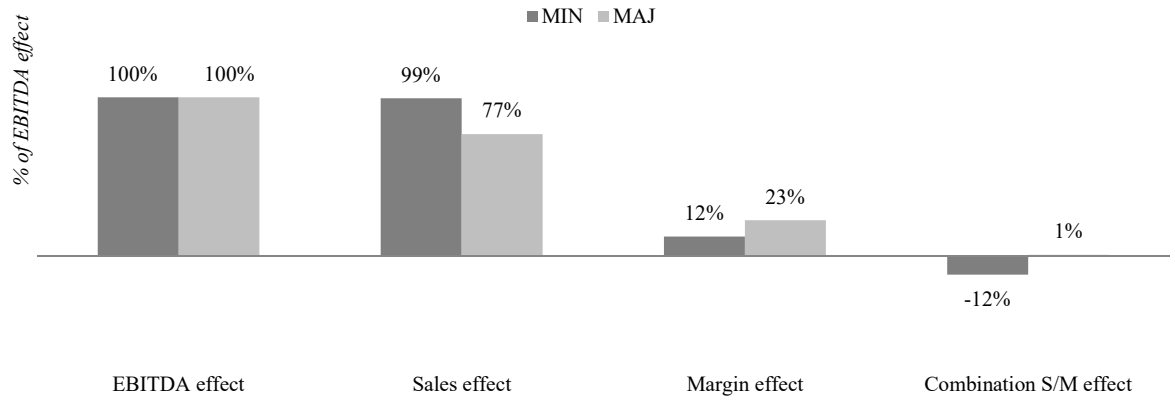
Table 2-18: EBITDA Growth Drivers

This table presents the value creation drivers detailing the EBITDA effect for MIN and MAJ. The figures shown include means and medians for EBITDA, sales, margin, and the combination sales/margin effect. To the right side we show p values for the one-sided T test and the Mann-Whitney test, used to test for the difference in mean and median values between MIN and MAJ, respectively. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Mean			Median		
Variable	MIN	MAJ	T Test (p value)	MIN	MAJ	Mann-Whitney Test (p value)
Observations	96	824		96	824	
EBITDA effect	1.2	1.5	0.09 *	1.1	1.0	0.35
Sales effect	1.2	1.1	0.84	0.6	0.7	0.63
Margin effect	0.1	0.3	0.02 **	0.1	0.2	0.08 *
Combination S/M effect	-0.1	0.0	0.42	0.0	0.0	0.25

Figure 2-12 shows the relative shares of the EBITDA growth components. Although the sales effect is the most important driver for both MIN and MAJ, it is relatively more important for MIN than for MAJ (99% vs. 77% of the EBITDA effect). Margin expansion accounts for 12% and 23% for MIN and MAJ and is therefore more important in MAJ. The residual combination effect capturing changes in both sales and margin simultaneously accounts for -12% and 1% for MIN and MAJ.

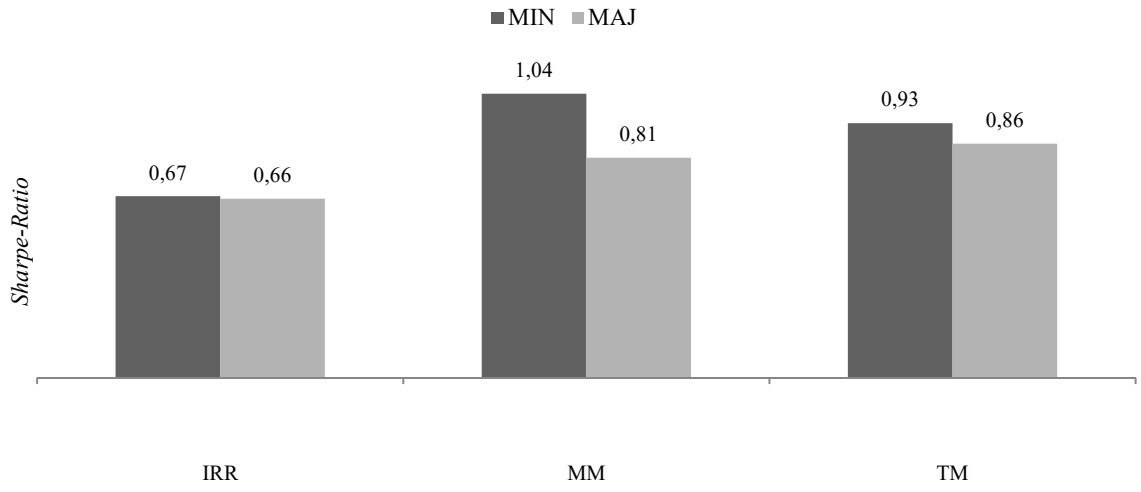
Figure 2-12: Relative EBITDA Growth Composition in MIN and MAJ



2.3.5.3 Risk and Return

For a risk-return analysis of MIN and MAJ we calculate the SR for IRR, MM, and TM (see Figure 2-13). We find that, concerning IRR, MIN and MAJ are almost at equal levels. Regarding MM and TM, MIN seem to offer a better ratio of risk versus return, meaning that for each point in standard deviation, MIN offer markedly higher returns than MAJ. Just as for the difference in absolute IRR in Table 2-16, time plays a role in explaining the equal SR concerning IRR.

Figure 2-13: Sharpe-Ratios for Return Measures of MIN and MAJ



2.3.6 Conclusion

We find that MIN deliver significantly lower returns and value creation than MAJ do. However, this lower performance of MIN comes with a lower risk in these transactions. The advantage MIN have above MAJ is a better risk-return ratio, i.e., they show better SR than MAJ. Thus, they are able to achieve higher returns in comparison to the risk incurred. Although the returns are lower in MIN than in MAJ in absolute terms, the variation in those returns are

markedly lower in MIN than in MAJ. In combination, this leads to the more favorable risk-return ratio in MIN and is in line with what we expected.

Table 2-19 compares our hypotheses on MIN returns, value creation, and risk-return with the findings based on our sample.

Table 2-19: Summary of Results

Hypotheses	**Results**
Returns	
H1: IRR, PME, MM, and TM are lower in MIN than in MAJ	- Mean IRRs equal in MIN and MAJ - Median IRR slightly lower in MIN than in MAJ - Mean MM, PME and TM significantly lower in MIN than in MAJ - Median MM, PME and TM lower in MIN than in MAJ
Value Creation	
H2: MIN gain less value creation from leverage than MAJ	- Mean and median leverage effect significantly lower in MIN than in MAJ
H3: MIN gain less value creation from margin expansion than MAJ	- Mean and median margin effect significantly lower in MIN than in MAJ
H4: MIN gain more value creation from sales growth than MAJ	- Mean sales effect higher in MIN than in MAJ - Median sales effect lower in MIN than in MAJ
H5: MIN gain less value creation from multiple expansion than MAJ	- Mean and median multiple effect lower in MIN than in MAJ
H6: MIN gain less value creation from FCF effect than MAJ	- Mean FCF effect lower in MIN than in MAJ - Median FCF effect significantly lower in MIN than in MAJ
Risk and Return	
H7: The risk-adjusted return (SR) is higher for MIN than for MAJ	- SRs for IRR are equal in MIN and MAJ - SRs for MM and TM are higher in MIN than in MAJ

In detail, the differences in the value creation effects reflect the differences in influence between minority and majority investors in PE deals. The lower leverage effect in MIN might be caused by the PE firm holding a minority stake and thus not having the right to implement a highly levered financing structure. Instead, the majority partner of the minority investor (e.g., private individuals, strategic investors) has the stronger say in the financing structure, which is likely more conservative than a typical PE financing structure in a MAJ. The margin effect is significantly lower for MIN as PE minority investors usually do not have the possibility to directly influence operations (e.g., through cost-cutting). The multiple effect might not be significantly different for MIN and MAJ because PE investors in MIN and MAJ may have similar market timing skills to determine the value-maximizing exit time, or they may not be able to time this much at all independent of whether they own a majority or not. In summary, the results show lower overall returns and value creation for MIN compared to MAJ.

Minority investors are confronted with several difficulties in influencing firm performance. As they do not hold an equity majority they also usually do not have majority voting rights. Therefore, they cannot make decisions without getting agreement from the majority shareholder. Decisions about changes in operations, governance, add-on acquisitions, or sales thus need to be made jointly. The GP wishing to use similar measures as he could use in a MAJ therefore needs much more arguing and likely better reasons to do so. To ease those difficulties, minority investors frequently ensure that they have a good personal fit with their majority partner. In order to be successful in convincing them, as opposed to making a decision qua majority ownership, the minority investor and the majority partner need to have a close connection. Also, there needs to be trust among the investors, otherwise stalemate situations may arise.

MIN display lower returns and value creation, but on the other hand offer a better risk-return relationship. This is true for both the GP directly investing in a minority stake and the LP investing in a fund that mixes in MIN or even focuses on MIN. We see MIN as a growing segment within the PE market and expect that the number of MIN will further increase. We believe that owing to the better risk-return characteristics MIN are a meaningful addition to PE funds. Also, as their importance is growing and GPs are usually keen on providing adequate returns to their investors, there must be ways to make MIN work well. Contractual agreements such as drag-along and tag-along rights as well as joint decision bodies independent of formal ownership seem to be adding this much influence for GPs that MIN after all are good investments from the PE industry's point of view. They support diversification both at the GP and LP level. They usually allow and require less leverage which may also be a criterion for the investment decision. Based on this, investing in MIN could help draw in additional investors, again, both GPs and LPs. MIN thus contribute to the growth of PE by potentially adding new investment opportunities and new investors to the PE industry. MIN themselves are a relatively new kind of investment but tremendously contributing to the ongoing maturing of the PE investment approach.

We present one of very few papers on PE MIN and the first providing deal-level evidence, presenting the investor's point of view. Future research should help further understand the MIN landscape, i.e., evaluate the importance of MIN over time, by regions and deal sizes. When looking at our sample where MIN are on average held 6 months shorter than MAJ, understanding whether more time would actually help to create more value would be interesting. Additionally, understanding the contractual agreements that offset equity ownership and help manifest investors' rights and influence should be looked at in more detail. This should

also help understand whether value creation at the level of the GP is different to the value creation on portfolio company level, as we analyze here.

3 Conclusion

3.1 Summary of Results and Implications

Private equity has developed into a major asset class attracting large amounts of capital and employing thousands of investment professionals and millions in the portfolio companies. Over time, it has matured into an established alternative to invest in. In order to understand how this industry has come to such prominent position and how it generates returns for its investors, one needs to understand what PE firms actually do with the companies they own.

Value creation is key for PE performance. Deal-level value creation determines deal returns, which in turn determine fund performance. Fund performance ultimately determines whether LPs are willing to invest in follow-on funds. Thus, understanding value creation on the deal level is at the heart of understanding PE. This dissertation analyzes value creation and its determinants. It provides a profound base of how value is created and how this differs between market segments within the PE industry. It also shows some distinct features of PE as of today – such as declined value creation, the rise of minority investments and the importance of trying to influence deal pricing.

The first essay analyzes differences in the sources of value creation in PE transactions. It differentiates four value creation drivers, which are the leverage effect, EV/EBITDA multiple expansion, EBITDA growth and the FCF effect. EBITDA growth is further split into sales growth and EBITDA margin growth. These four drivers are analyzed regarding their size and relative contribution for different industries, regions, transaction sizes and across time. This analysis helps understand how the different PE market segments differ in importance of the individual value creation drivers. Additionally, it provides important evidence about how each of the value creation drivers has developed over time.

The results show that the largest share of total value creation was contributed by operating improvements within the portfolio companies. This holds true for each of the three time categories analyzed between 1984 and 2013. Though overall value creation has come down from 4.3x in 1987-2000 to 2.8x in 2009-2013, the relative importance of operating improvements has increased from 46% to 53%. It is important to note in this respect, though, that the absolute effect of operating improvements has also come down, but not as drastically as that of the other value creation drivers. Within operating improvements, the largest part resulted from increases in EBITDA during the holding period. On a regional level, North American transactions delivered the highest value creation, followed by European and Asian deals. Whereas Asian deals gained more of their value creation from sales growth and European deals from operating improvements, North American deals gained more from the use of debt. On an industry level, the results show that deals in technology gained more from multiple expansion and less from operating improvements than those deals in other industries. Lastly, an analysis by transaction size highlights strong differences between small- and large-cap deals that created less value. Smaller transactions gained more from multiple expansion, whereas investors made higher use of leverage in larger deals. The novel dataset used in this essay shows where the focus has been set in value creation over the course of 25 years. Most importantly, the results underline the strong differences between deals of different sizes and the ongoing maturity of private equity, manifesting itself in ever falling value creation.

The second essay details EV/EBITDA pricing and its influence on multiple expansion as one distinct driver of value creation and returns. It analyzes the prices paid and received in PE transactions in comparison to the prices of other transactions from the same market segment. In so doing, the importance of low entry and high exit pricing for deal returns can be quantified and recommendations for where to focus for GPs are given.

The results show the importance of multiple expansion for deal returns and help understand the pricing mechanisms in more detail. Multiple expansion achieved during a transaction is strongly correlated with market price levels at the time of entry and exit. For GPs, being able to buy deals below current market prices and sell them above positively influences multiple expansion and thus deal returns. The results further show that selling high is about twice as important for multiple expansion and returns as buying low. Based on these results, the success in pricing is attributed to GPs skills, as every price is the outcome of a negotiation, whether prepared or not, and can thus be influenced by a GP. For GPs this means that they need to decide whether it is worth spending their effort on achieving favorable pricing as opposed to creating value from other drivers. For LPs, this means they should try to find GPs who are at least aware of the importance of pricing, whether they actually use it to generate sufficient returns or not.

The third essay focuses on PE minority investments as one of the emerging types of investment within the ongoing maturity of the industry. The essay compares the value creation and returns of PE minority and PE majority investments. It also compares these investment types regarding their risk-adjusted returns.

The results show that the value creation and returns of minority investments do not reach those of majority investments. This is also true for the individual value creation drivers. On a risk-adjusted base, the returns of minority investments beat those of majority investments. The essay details the value creation, return and risk characteristics of PE minority investments, in comparison to traditional majority investments. As minority investments increase in appearance, the results help understand this rising type of investment. They further show that from a diversification point of view, adding minority investments can make sense for GPs as well as for LPs.

This detailed understanding of value creation and its determinants helps GPs and LPs alike in understanding where value is created in PE transactions. It provides them with an overview of the important drivers in each market segment and about how this has changed over time. Further, it sets the spotlight on pricing as one component of achieving multiple expansion and returns and on minority investments as another type of deal with a different risk-return profile.

PE is an industry that is constantly developing and evolving, in size, in the number of participants and in the types of deals that are made. This is a clear sign that its process of maturing is still ongoing and should continue to do so. This comes with rising efficiency and dissolution of information asymmetries. Most actors are becoming more professional and the 'privateness' of sourcing deals and to which conditions to do this is disappearing. Participants in this maturing industry need to know which parts and aspects of the business they should place focus on. The results presented is this thesis help understand the following aspects of a maturing PE industry. There is no one-fits-all approach concerning value creation. Each market segments and each type of deal shows different drivers that are more or less important. Operating improvements are important. The results show that the times where GPs could achieve sufficient returns only through using leverage seem to be over. Instead, working in and with the portfolio company is necessary. The evidence shows that in either setting – large or small deals, high or low tech, minority or majority – the GPs need to involve themselves.

3.2 Future Research and Outlook

This thesis sheds light on highly relevant topics for practitioners and offers fertile opportunities for future research, expanding the topic of value creation in PE deals, and analyzing how the use of individual drivers and overall value creation strategies differ by GP. E.g., which drivers are use in distressed investments, in buy and build concepts, where strong inorganic growth takes place? Concerning the mechanisms determining deal pricing, stimulating questions are: how does the entry type influence pricing, e.g., in auctioned versus proprietary sourcing processes? How do general market sentiment or competition influence deal pricing compared to the portfolio companies' potential – i.e., is there a 'de-rationalizing' of pricing by GPs out of fear of losing the deal? What is the tradeoff between a fairly priced deal and a deal that may be expensive, but worth the prices thanks to sufficiently high other value creation potential?

The discussion of skill and luck requires further research in order to really support LPs in picking the right GP. Identifying which GPs or at least which types of GPs are skilled, e.g., depending on their fund size, their industry expertise or their regional focus. Breaking this down to the level of the individual investment manager would be the next step in analyzing the sources of GP performance. First research has started on this level (Acharya et al. (2013), Kaplan and Strömberg (2009), Korteweg and Sørensen (2014)) but there is need for more detailed analyses. Minority investments require further research, especially in understanding how control can be exerted although only a minority is owned – while keeping in mind that the majority and minority owners need to work together constructively. Understanding why minority investments provide lower returns and value creation although PE investors should be expected to secure their influence is a further route to be taken. These are paths for future research, largely based on more detailed data.

A large question going forward is the maturing of PE. It will likely continue to attract capital and participants and further professionalize its processes and structures. Although the participants claim PE to be independent of other asset classes, past cycles indicate that there are similar dynamics at work as in more established asset classes. Additionally, the industry is becoming increasingly mature in term of size, participants and variety of investment types. This poses new challenges for GPs and their way to create value and generate high returns for their investors. GPs should note that operating improvements in their portfolio companies are key to ensuring sustainably high returns. In order to achieve this, it is no longer enough to buy a company and leave it in the hands of management only, no matter how capable. As investors praise themselves of providing "smart money" (Schefczyk (2006) and Sørensen (2007)), they should do just that: provide capital and intellectual abilities. This is independent of the deal structure they are engaged in, be it a normal majority investment, a minority investment or a club deal. A practical implication could be a trend towards a separation of the GPs' teams into people sourcing and doing the deals and into people responsible for operationally supporting portfolio companies.

It is becoming increasingly difficult for GPs to find their individual model to approach the business. No unique skillset that can clearly be identified has been found so far by previous research. Even if there were skills, the second challenge would be to find the GPs who have them (Korteweg and Sørensen (2014)), which up to now seems difficult. LPs thus need to apply their own metrics for evaluating which GPs to invest in. A promising approach would be to pick GPs who are aware of their strengths and consistently and successfully make use of them. Thus, GPs need to develop higher awareness for the levers they are good at using – and the ones they are not. Some are good in buying low and selling high, whereas others rather spend

their effort on helping operations run better. Still others are good at putting high levels of leverage with favorable conditions to work.

If Private Equity is able to address some of these points, it may further mature. If not, it may stay an industry of participants with arbitrary approaches and investors who can only hope to pick the best talent. While the good old days were profitable for many of the GPs and LPs, the future may prove to eliminate the wheat from the chaff.

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