Buy Low, Sell High? Do Private Equity Fund Managers Have Market Timing Abilities?

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Abstract

When investors commit capital to a private equity fund, the money is not immediately invested but is called by the fund manager throughout an investment period of up to five years. This business model allows private equity fund managers to invest the committed capital at their own discretion, which gives them the flexibility to time the markets. Based on 5,366 private equity deals, which are benchmarked against around 11,000 transaction market multiples and 170,000 trading market multiples, we find evidence that on average private equity funds are able to add value by timing the markets. Throughout the holding period, private equity funds achieve on average a 0.5 EBITDA market multiple expansion. Market timing ability is not captured by performance measures such as the PME, yet it is a potential source of returns for investors.

Keywords: Private Equity, Mergers and Acquisitions, Value Creation, Market Timing

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1 Introduction

Market timing ability is one way for investment managers to achieve high returns on managed assets. An asset class which frequently engages in buying and selling companies is private equity (PE). In PE market timing can be an important source of value creation. PE funds collect capital from limited partners (LPs) to take over (large) equity stakes in portfolio companies and sell them at a later stage of the PE funds' lifecycles. In this context, a PE fund acts as a blind pool of capital to which limited partners commit their capital for a period of 10 years (or more), whereas the first three to five years are intended for investments. It is the PE fund manager, who decides - independent of the LP - when to buy and when to sell a specific portfolio company. In contrast to mutual funds or hedge funds, the capital is not immediately transferred from LPs to the PE funds, but only when a deal is done. The PE fund model gives fund managers not only discretion in their investment decisions, but also the opportunity to time the markets when exiting their investments.

In this paper we focus on whether PE fund managers are able to use their discretion over timing to create returns for investors – in other words, whether they have market timing ability. We focus our study on North American and European deals and analyze whether PE funds sell their portfolio companies when average market multiples are higher than at the time of investment. In order to track PE fund managers' market timing, we define market multiple expansion as the difference between the average market valuations at investment and the average market valuations at exit. Market valuations are defined as enterprise value (EV)/EBITDA multiples of comparable benchmark groups. As alternative benchmarks we examine both strategic transaction multiples[1] and trading multiples, which we match with the PE deals based on deal time, target industry, and target region. Using this benchmarking approach, we match 5,366 North American and European PE deals in the time period 1998 to 2013 for which the investment and exit dates are known with around 11,000 multiples of strategic acquisitions and 170,000 multiples of listed companies.[2] Furthermore, we develop a framework to investigate whether the PE fund managers who possess market timing abilities achieve this at investment and/or at exit.

Our findings provide empirical evidence that PE fund managers do time the markets successfully. On average, fund managers sell their portfolio companies when market multiples are 0.5 higher than at the time of investment, whereas the top quartile of PE deals achieves a market multiple increase of 3.2 and the bottom quartile loses 2.2. Market timing abilities of North American

[1] Multiples of transactions which are not made by financial sponsors (e.g., PE funds, mutual funds, or hedge funds).

[2] Trading multiples are defined as *(Market capitalization + net debt)/EBITDA*.

and European PE fund managers are similar. We also find that top-tier PE firms[3] are no better at market timing than the funds of non-top-tier PE firms. Using a technique of separating market timing ability with regard to the entry and exit side of a deal, we find that good timing at entry *and* exit is achieved by around 30% of the deals in our sample. Overall, our results suggest that market timing comprises around 16% of overall fund performance.

The contribution of our paper is as follows. First, our paper contributes to the strand of literature which focuses on the performance and value creation of PE funds. The existing PE literature that focuses on market timing abilities of PE fund managers has mainly adopted an initial public offering (IPO) perspective (see for example Pástor *et al.* (2009) or Cao and Lerner (2009)). The literature has investigated whether market timing has any impact on the long-term performance of portfolio companies after being sold by a PE fund. However, IPOs are only a small part of PE exits, and our paper is able to analyze market timing ability more generally, and more immediately as we focus on entry and exit transactions.

Second, we contribute to the discussion on the market timing ability of asset managers by making use of the fact that PE fund managers have complete discretion and decision-making power over their investments and exits. This setting enables us to investigate market timing ability and isolate it from other investment decision drivers. Mutual funds and hedge funds do not allow for such an investigation as fund managers in these asset classes might have to reduce their investment positions in the face of investors' capital calls or other external factors (see, e.g., Bollen and Busse (2001)).

Finally, our paper adds to the broad discussion of whether PE funds add value to investors relative to public markets. A standard approach comparing PE performance to public markets is the public market equivalent (PME) as introduced by Kaplan and Schoar (2005). A potential limitation of the PME is that it does not give credit to PE fund managers who time their investments well. For example, a fund that sold all of its investments in 2007 (before the Lehman crash) might have the same PME as a fund that sold in 2009 (after the Lehman crash). The PME does not acknowledge the fact that the exit in 2007 would have been preferable from a timing and value creation perspective. The difference would show up in money multiples and in IRRs but not in the PME. Given that investors give discretion to PE fund managers to choose both the portfolio companies and the time of investment, the managers' timing ability is something investors should pay attention to.

[3] In line with the existing literature (see, e.g., Leslie and Oyer (2008)), we define top-tier PE firms based on total funds raised in the last 10 years.

The remainder of this paper is organized as follows. Section 2 reviews the related literature. Section 3 outlines the concept of value creation through market timing. Section 4 presents the data sample and explains the benchmarking process. Section 5 provides and discusses the empirical results. Section 6 concludes.

2 Institutional Background and Literature Review

A major difference of the PE fund model, in comparison to mutual funds and also hedge funds, is that PE funds do not receive the investors' capital immediately after commitment, but have the option to call the committed capital during an investment period of up to five years after the fund's closing date. Furthermore, there is no economic incentive to invest rapidly as management fees are paid on committed, rather than invested capital. The committed capital is called on a *pro rata* basis following the PE fund's acquisition of a portfolio company. The return calculation of the PE fund only starts when the respective capital has been invested in the portfolio company. Capital that has not been committed yet does not affect the PE fund's performance in the same way as it affects the performance of a mutual fund (assuming the money is held as a cash position). PE funds usually do not acquire stock positions for trading reasons, but they buy large (mostly majority) stakes in companies and hold them for an average of four to six years. Consequently, the time period for which investors' capital is tied to a PE fund is significantly longer than for investments in mutual or hedge funds. Once committed, the PE fund's investors cannot access their capital until the PE fund sells the assets (theoretically, this happens only at the end of a fund's lifecycle, i.e., after 10 to 12 years). This model gives fund managers not only discretion in their investments, but also significant options to time the markets when exiting their investments – without time pressure from investors. We seek to investigate whether these PE-inherent features contribute to the abilities of PE fund managers to time the markets.

Our analysis relates to three strands of literature. We examine the existing research on performance measurement, PE investment cycles and whether managers of publicly listed assets have market timing ability.

2.1 Private equity performance measures

Until the early 2000s, most research focused on net IRR as the sole PE performance measure (see, e.g., Ljungqvist and Richardson (2003a), Jones and Rhodes-Kropf (2003)). An alternative metric commonly used to assess PE fund performance is the investment multiple, which divides the sum of all cumulative distributions and the residual fund value over the paid-in capital (Harris

et al. 2014). However, as Harris *et al.* (2016) more recently pointed out, neither net IRRs nor investment multiples allow for a direct comparison of PE returns with public market performances.

Aware of the limitations of the net IRR, Kaplan and Schoar (2005) developed the PME – a relative market multiple.[4] The PME separates cash flows between the fund and the LP into (i) distributions (cash flow returned to the LP net of carried interest) and (ii) calls (investments including management fees by the LP into the fund). Distributions and calls are discounted with realized market returns (e.g., from the S&P 500). The ratio of these two valuations is the PME, which is greater than one if the value of the distributions exceeds the cost of calls. Although the original PME was based on various assumptions, Sørensen and Jagannathan (2013) note the robustness of the PME regarding risk and trading strategies. A major shortcoming that they mention is that the PME does not consider illiquidity or investment capacity. Robinson and Sensoy (2011) estimate a "tailored PME" that substitutes the S&P 500 with benchmarks that fit individual PE types (the Fama-French size tercile index for buyouts and the NASDAQ index for venture capital (VC) deals). In one of the most recent studies that make use of the PME, Harris *et al.* (2016) employ a number of investable benchmarks as an alternative to the S&P 500, accounting for different perceptions of risk on the side of LPs. More generally, Gredil et al. (2014) have developed the "direct alpha" method of measuring performance relative to public markets as an excess annual return.

A limitation of the PME measure is that it does not control for market timing. One may argue that market timing ability does not matter from the perspective of an institutional investor with a fixed asset allocation in place (e.g., 20% private equity) or under the assumption that an investor always reinvests capital distributions by PE funds into public equity. If an investor immediately reinvests the capital distributed by a PE fund in the same asset class, market timing ability may have limited value as your exposure to a specific asset class remains constant. Yet, in reality we observe that it is rarely possible to re-invest into private equity immediately as there is a gap between committing and investing into a PE fund. Institutional investors also differentiate between a strategic and a tactical asset allocation. Strategic asset allocation defines the average allocation to a specific asset class, whereas the tactical asset allocation allows managers – within a predefined scope – to over- or under-weight a specific asset class. Managers may benefit from market timing ability as they may for example hold cash for some time instead of directly reinvesting the capital.

[4] Long and Nickels (1996) developed an early version of the PME, which returns an IRR and not a multiple. It is known today as the ACG Index Comparison Method.

2.2 Relationship between market cycles and PE fund managers' investment activities

Lerner (1994) was one the first to show that fund managers react to market cycles. Based on a sample of 350 venture-backed firms, he finds that VC fund managers successfully raise capital for follow-on funds by taking their portfolio companies public at market peaks. By developing a model for the optimal IPO timing, Pástor *et al.* (2009) analyze IPOs from 1975 to 2004 to show that buyout sponsors patiently await favorable market conditions for new leveraged buyout (LBO) listings and then react to changes quickly. Ljungqvist and Richardson (2003b) observe the investment and exit behavior of PE funds. They show that funds deliberately call committed capital when investment opportunities improve and exit their investments by taking advantage of favorable business climates. However, the authors also argue that only existing and established funds have the ability to make use of short-term changes in market conditions. Cao and Lerner (2009) investigate "quick flips", i.e., reversed leveraged buyouts (RLBOs) that went public in less than a year after the LBO. These quick flips are usually triggered by hot equity markets in which fund managers see favorable placement opportunities for their portfolio companies. In a follow-up study Cao (2011) shows that buyout funds reduce LBO holding periods for new issuance under more favorable external conditions or high industry valuations. In that sense he provides evidence that market timing can lead to value destruction. Jenkinson and Sousa (2015) support the window of opportunity hypothesis in which they show that exit strategies (IPOs and secondary deals[5]) are influenced strongly by debt and equity market conditions. Public market listings are positively correlated with stock market rises.

This strand of literature outlines the role that the market cycles play in the investment decisions of PE fund managers. Our paper builds on this literature to analyze – by using private transactions to assess target valuations – whether, and to what extent, fund managers create value by reacting to market cycles.

2.3 Marketing timing ability of mutual fund and hedge fund managers

There exists a well-established literature in the context of mutual funds and hedge funds that discusses managers' ability to time the markets. Merton (1981) separates security selection and market timing of mutual fund managers. He and numerous follow-up studies (see, e.g., Henriksson and Merton (1981), Cumby and Glen (1990), Coggin *et al.* (1993), Fletcher (1995), Bollen and Busse (2001)) find an inverse relationship between market timing and security selection abilities. They argue that mutual fund managers do manage to time markets efficiently in their

[5] In a secondary deal, a portfolio company is sold by a PE fund to another PE fund.

acquisition and exit decisions but mostly at the expense of favorable asset selection. Other scholars deny the existence of market timing skills in the mutual fund industry altogether (see, e.g., Chang and Lewellen (1984), Henriksson (1984), Grinblatt and Titman (1989), Chen *et al.* (1992), Volkman (1999), Wermers (2000)). Bodnaruk *et al.* (2015) find positive downside risk timing abilities among mutual fund managers. The hedge fund literature also focused on market timing. The existing research shows mixed results: compared with mutual funds and also with PE, hedge funds invest in smaller and more opaque securities (Griffin and Xu (2009)). Based on monthly hedge fund returns in the US, Chen and Liang (2007) find evidence for fund manager market timing ability, while Cao *et al.* (2013) observe liquidity risk timing ability. Griffin and Xu (2009), on the other hand, conclude from an analysis with long portfolio holdings that hedge fund managers do not have market timing ability. Also using long portfolio holdings, Agarwal *et al.* (2015) find tail risk timing ability.

3 Value Creation through Market Timing

PE funds typically create value through three drivers: multiple expansion, EBITDA improvements, and deleveraging. The latter two are largely operational and financial value creation drivers. Multiple expansion, in turn, refers to the delta between investment and exit valuations and can also be driven by external factors: a PE fund acquires a portfolio company for a 10x EV/EBITDA multiple and sells the company for a 12x multiple. The delta of 2x is referred to as multiple expansion and, of course, positively impacts the individual deal performance. Guo *et al.* (2011) investigate the value creation drivers in (US) buyouts and find that the changes in industry valuation multiples make up 20% of overall value creation.[6] In a more recent study based on approximately 2,000 buyout deals, Puche *et al.* (2015) draw a more moderate picture. They estimate that 15% of value creation comes from the so-called 'multiple effect'. Puche & Braun (2016) focus in their study on negotiation and not timing skills of GPs as we do in our study, but they confirm the importance of market valuation levels for multiple expansion. Besides an overall positive correlation between fund returns and multiple expansion, they further show that buying (selling) below (above) market valuations has a positive impact on multiple expansion. Leleux *et al.* (2015) note that multiple expansion is achieved either by multiple engineering (proving to the market that the portfolio company is now worth more) or by multiple surfing (buying at the low

[6] Changes in operating performance make up 20% and leverage makes up 60%.

of a cycle and selling at the peak) or both. Multiple engineering is linked to operational improvements. For instance, in the case of significant revenue growth, the EV/EBITDA valuation may increase as investors tend to pay higher prices for larger and faster growing companies). In contrast, multiple surfing is pure market timing, which is the focus of our study. This effect includes the management's ability to increase growth as well as – and more relevant for our study – the fund manager's ability or luck to time the markets. They find the multiple effect to be as high in North America as in Europe.

3.1 Market timing as a performance measure

In our study we investigate whether the average fund manager systematically achieves multiple expansion through market timing - we call this *market multiple expansion*. To this end, we separate the ability to time the markets from multiple engineering that is driven by a company's operational improvements. To create value through market timing, fund managers should try to buy when markets are low and sell when markets are high. In order to track the market timing ability of fund managers, we define market multiple expansion as the delta between the average market valuations at investment and the average market valuations at exit – independent of the individual portfolio company valuations. We adopt this approach as information on the price and/ or multiples paid at entry and exit is not always available. An important implicit, but reasonable, assumption is that prices paid for assets will be closely correlated with the prices paid in contemporaneous transactions, and with the prices of similar companies observed in public markets.

$$MARKET\ TIMING\ TRANSACTION =$$

$$MARKET\ TRANS\ MULT_{EXIT\ (R,I)} - MARKET\ TRANS\ MULT_{INVESTMENT\ (R,I)} \qquad (3.1)$$

where *MARKET TIMING TRANSACTION* is a fund manager's market timing ability based on the market multiples of strategic transactions that are comparable to the PE transaction. *MARKET TRANS MULT*$_{EXIT\ (R,I)}$ is the median transaction multiple in the quarter of the exit benchmarked against the PE target's region and industry (see section 4.2 for a detailed description of the benchmarking process). *MARKET TRANS MULT*$_{INVESTMENT\ (R,I)}$ is the median transaction multiple in the quarter of the investment benchmarked against the PE target's region and industry. Funds create value from timing it as the market multiple at which they sell is higher than the market multiple at which they buy. It is important to stress that the multiples that we use are not PE deal multiples but transaction multiples of the broader strategic mergers and acquisitions (M&A) market.

We also investigate fund managers' market timing abilities based on *trading* multiples. They are only available for listed companies but the advantage is that they are available in much greater numbers:

$$MARKET\ TIMING\ TRADING =$$

$$MARKET\ TRADING\ MULT_{EXIT\ (R,I)} - MARKET\ TRADING\ MULT_{INVESTMENT\ (R,I)} \qquad (3.2)$$

where *MARKET TIMING TRADING* is a fund manager's market timing ability based on the market trading multiples of companies that are comparable to the PE fund's target company. *MARKET TRADING MULT$_{EXIT\ (R,I)}$* is the median trading multiple in the quarter of the exit benchmarked against the PE target's region and industry (again, see section 4.2 for a detailed description of the benchmarking process). *MARKET TRADING MULT$_{INVESTMENT\ (R,I)}$* is the median trading multiple in the quarter of the investment benchmarked against the PE target's region and industry. Trading multiples are composed of the listed (strategic) companies' market capitalization plus net debt divided by EBITDA.

Take, for example, the case of Eldon Holding AB: Eldon is an industrial company with headquarters in Sweden. The company was acquired by the EQT II fund in March 2001. After a holding period of five years, Eldon was sold in a trade sale in March 2006. In Q1 2006, when EQT II acquired Eldon, the average transaction multiple in the European industrials industry was 7.0 (the average trading multiple was 6.0). When EQT II sold Eldon in Q1 2006, the average transaction multiple was 11.2 (the average trading multiple was 8.1). This was almost the highest multiple during the entire exit period. Only in Q2 2005, when market multiples were at 13.7, would an exit have resulted in even better exit timing. EQT II therefore timed the markets well and achieved a delta between market multiple at investment and market multiples at exit of 4.2 (2.1 according to trading multiples). Hence, EQT II created value through market timing in their investment and exit of Eldon.

In light of ownership transfers (developed market PE deals are usually majority takeovers), transaction multiples typically include transaction/ takeover premiums. This is why transaction multiples are generally higher than trading multiples (see Appendix 1).[7] As a final approach, we offer a third set of benchmark multiples where we add average yearly transaction premia (derived from the transaction multiples) to the trading multiples for comparison purposes:

[7] In our sample, they are on average 26% higher but this varies year by year.

$$MARKET\ TIMING\ TRADING + PREMIUM =$$

$$(MARKET\ TRADING\ MULT + PREM_{EXIT\ (R,I)}) - (MARKET\ TRADING\ MULT + PREM_{INVESTMENT\ (R,I)}), \textit{(3.3)}$$

where *MARKET TIMING TRADING + PREMIUM* is a fund manager's market timing ability based on the market trading multiples of comparable companies plus a transaction premium. *MARKET TRADING MULT + PREM$_{EXIT\ (R,I)}$* is the median trading multiple plus a transaction premium in the quarter of the exit benchmarked against the PE target's region and industry. *MARKET TRADING MULT + PREM$_{INVESTMENT\ (R,I)}$* is the median trading multiple plus a transaction premium in the quarter of the investment benchmarked against the PE target's region and industry. Transaction premia are the average quarterly differences between transaction multiples and trading multiples.

3.2 Investment and exit timing

In addition to investigating the general market timing ability of fund managers, we explore at which point in time PE fund managers time the markets: do fund managers time the markets at investment *and/or* at exit or do they – if at all – time the markets only on one of those two occasions? This question is relevant as it helps us to understand how systematically PE funds time the markets.

To analyse the market timing skills of fund managers on the investment and exit side, we develop a framework which puts the market multiple at the deal date (investment and exit) relative to the market multiples in the period before and after the deal date. Using this approach, we can observe whether PE funds deliberately choose the right quarter to buy/sell their portfolio companies. Given the general lifecycle of a PE fund (10 to 12 years), the investment/exit period is typically three to five years. In our model, we assume an average investment period of 12 quarters (three years) during which PE funds have time to invest. Referring again to the acquisition of Eldon by the EQT II fund: the European industrials market multiple in Q1 2001 was 7.0. Market multiples in the investment period, which for this fund was from Q3 1999 till Q3 2002, were on average 13% higher (excluding the multiple in Q1 2001 when Eldon was acquired). This is good news for EQT as the EQT II fund caught the right window for its investment from a market timing perspective. Obviously, at exit, EQT would want the market multiple to be higher than the average market multiple in the exit period. We use the following formulas to compute the investment and exit timing:

$$INVESTMENT\ TIMING = \frac{MARKET\ TRANS\ MULT_{INVESTMENT\ (R,I)}}{\frac{\sum_{i=-6}^{6} MARKET\ TRANS\ MULT_{i\ (R,I)}}{12}} - 1, \qquad (3.4)$$

$$EXIT\ TIMING = \frac{MARKET\ TRANS\ MULT_{EXIT\ (R,I)}}{\frac{\sum_{i=-6}^{6} MARKET\ TRANS\ MULT_{i\ (R,I)}}{12}} - 1, \qquad (3.5)$$

where *INVESTMENT TIMING* and *EXIT TIMING* are the fund managers' investment and exit timing abilities. *MARKET TRANS MULT$_{INVESTMENT\ (R,I)}$* and *MARKET TRANS MULT$_{EXIT\ (R,I)}$* are the transaction market multiples in the quarter of the realized investment and exit, respectively, benchmarked against the target's region and industry. The denominator is the sum of all 12 transaction market multiples (*MARKET TRANS MULT$_{i\ (R,I)}$*) in the fund's investment/exit period (six quarters before the investment/exit and six quarters after) divided by 12 which is the number of quarters in the investment/exit period. Fund managers who are buying a portfolio company seek to minimize *INVESTMENT TIMING*, while fund managers who are selling seek to maximize *EXIT TIMING*.

4 Data Sample and Benchmarking Process

4.1 Data sample

Our analysis on the market timing ability of PE fund managers is based on 5,366 PE transactions made between January 1, 1998 and December 31, 2013 by 1,571 individual PE funds both in North America (United States and Canada) and Europe. We gather all our PE data from Preqin.[8] We know for all transactions: (i) the date of investment, (ii) the date of exit, (iii) the target name, (iv) the target industry,[9] and (v) the target region. In addition, for the majority of the deals we have more detailed information on deal characteristics (e.g., holding period, deal size, target investment and exit value, exit net IRR), PE fund characteristics (e.g., fund age, fund sequence, fund (target) size), and PE firm characteristics (total funds raised in the last 10 years).

The Preqin database lists almost 29,000 different PE deals for the time period we are interested in. These deals include (i) deals that are invested but not yet exited and (ii) deals that have been exited (i.e., PE funds have sold their investments). To investigate the ability of PE funds to exploit value by market timing, we include only deals in our analysis which have already been exited by the respective PE funds. This reduces the data sample to approximately 8,000 deals. We further remove restructuring and write-off cases (approximately 600 deals) as market timing only

[8] Preqin is a widely used source of information in the PE-related literature (see, e.g., Harris *et al.* (2016)).

[9] Target industries are based on the Global Industry Classification Standard (GICS); we exclude portfolio companies that mainly operate in the real estate, financial institutions, and public services industries.

plays a subordinate role in these deals (see also Achleitner *et al.* (2011)). Moreover, if Preqin does not know the exact date of an investment/exit, it assumes by default that the deal took place on June 1 of a given year. Thus, we are forced to remove all June 1-deals as they give us no precise indication for fund managers' market timing abilities (approximately 2,000 deals). After this screening process, we end up with 5,366 PE deals for which we have precise investment and exit information.

Table 1 shows that 75% of all the remaining 5,366 deals that are relevant for our research are buyout deals and 12% are PE growth deals[10]. 'Other' include PIPE (private investments in public equity) deals and special situations. Our deal sample includes club deals but the majority (84%) are sole-sponsored deals. 45% of the deals are exited as trade sales, 32% as secondary sales, and 7% as IPOs. 15% of the exits are 'Other,' which include sales to managements and unspecified exits. Fund managers do not always sell 100% of their holdings in a company at once; frequently they divest only a fraction of their total ownership (see, e.g., Jenkinson and Sousa (2015)). These exits are referred to as partial exits. In our data sample, partial exits comprise 30% of the deals, which explains why Table 1 lists more exits (6,142) than investments (5,366). A large proportion of these partial exits are IPOs. In partial exits, market timing depends on market multiples at several exits. Unfortunately, we do not know the portfolio company share sold at each exit. To overcome this drawback, we take the average market multiples at each partial exit (if available) to form a total exit market multiple.[11]

Given our requirement that at least one exit has occurred, our sample of investments is focused on the period 2000 to 2009 (80% of the sample) and decrease for the last four years of our observation period (7%). It takes on average 4.5 years (holding period) until portfolio companies are sold. Consequently, on the exit side, there is a stronger weight on the years 2010 to 2013 (49%). As described above, investments that are not liquidated by the end of 2013 are not included in our sample. The average holding period of our deals is comparable to earlier studies: Lerner (1994) measures a mean holding period of 4.2 years for his 1978 to 1992 dataset and Cao (2011) reports 3.8 years for buyout deals only. In an unreported analysis we exclude all investments made in 2011 and 2012 which exited before the end of our observation period in 2013. These exits can be regarded as early exits or, in the words of Cao and Lerner (2009), as "quick flips" as their holding period is significantly shorter than the average holding period. Our empirical results do not change

[10] PE growth capital deals are equity investments into a private company, where the PE fund typically acquires a non-controlling or minority stake, with the view to provide capital to increase the expansion plans of a company.

[11] In an unreported robustness test we exclude all partial exits from our analysis. The results remain stable.

when excluding these transactions. Also, the results do not change when only including investments with holding periods of more than three years.

[Insert Table 1 about here]

4.2 Matching PE deals with market multiples

In our study, we are interested in the market multiple expansion of PE investments. Therefore, we map PE deals to transaction multiples of comparable M&A deals and to trading multiples of comparable publicly-listed companies. This approach allows us to investigate the market timing activity of PE fund managers independent of PE transaction valuations (which are not generally available). For the purpose of our study, we benchmark the PE deals to transaction and trading multiples of strategic companies. We define strategic M&A deals as deals in which no financial sponsors are involved. We collect a sample of 10,710 strategic transactions (see equation 3.1) and conduct robustness tests with a sample of almost 170,000 trading multiples (see equations 3.2 and 3.3). Both samples are collected from Thomson One. The regional and industrial definitions of Preqin (from which we obtain our PE deal sample) and Thomson One (from which we obtain our benchmark sample including company valuations) are comparable: North America is the largest region in both databases, while consumer products is the largest industry. Also, the distribution of deals across the observation period is similar in the two databases.

The matching process of the two samples is crucial in order to draw conclusions from the ensuing empirical analysis. How do we match our PE deals with the transaction and trading multiples of strategic companies? More practically speaking, how do we know whether M&A markets were favorable for comparable acquisitions when a PE fund bought a portfolio company? Our approach is to link transaction and trading multiples to the PE deals based on three matching criteria:

1. Investment/exit time (the quarter in which the deal takes place)
2. Target region (North America or Europe)
3. Target industry (consumer products, energy, healthcare, industrials, materials, technology, telecommunications)

We take the median of all matched transaction/trading multiples to form a benchmark multiple. Following an identification strategy, we gradually tighten the matching criteria. First, we benchmark by date only. Second, we match the deals based on the target's home region on top of the deal date. Third, we replace the target's region with the target's industry. In the last step, we run

the analysis with all three matching criteria. We find a correlation between transaction and trading (excluding premiums) multiples of 0.5 (see Appendix 1), but observe some variation in the correlation when comparing different industries and regions. All multiples follow a similar trend (e.g., peaks in 2006/2007 and slumps in 2008/2009) while their volatility and magnitude differs. Multiples in North America are fairly consistently higher than in Europe, and multiples in the healthcare industry are consistently higher than in the energy industry - see Appendix 2 and 3 for a graphical representation. This is why we believe it is important to benchmark our multiples not only by deal date but also by region and industry.

In addition, to ensure that our benchmarking analysis is not driven by outliers, we define a minimum threshold of five comparable transactions and trading comparators. For example, for the industry group 'materials' we only have three transaction multiples available in North America for deals which took place in Q1 2000. In order to avoid our analysis being driven by such outliers, we exclude any PE deals for our market timing analysis that took place in the industry group 'materials' in North America in Q1 2000. This procedure reduces our transaction benchmark multiple sample from 896 multiples (64 quarters * 2 regions * 7 industries) to 566 multiples. For trading multiples, we only see an insignificant decrease from 896 multiples to 876 multiples. The remaining benchmark groups are sufficiently large in terms of available multiples: on average, we have 12 multiples per benchmark group for transaction multiples and 213 multiples per benchmark group for trading multiples.

An underlying assumption of our benchmarking approach is that PE multiples and strategic market multiples are highly correlated. Robinson and Sensoy (2011) provide strong empirical evidence that public and private equity valuations move together. As a further check on this correlation we use an alternative database of 1'600 exit multiples from Thomson One (as used by Morkoetter and Wetzer (2016) and find a correlation of 0.8 with benchmark transaction multiples (see Appendix 4 for a graphical representation). The correlation between PE transaction multiples and benchmark trading multiples is much lower at 0.2 but this is mainly because they exclude transaction premiums. The correlation increases to 0.5 when we add transaction premiums to the trading multiples.

4.3 Fund characteristics

In addition to the deal-level information, we also include fund-level characteristics in order to determine whether specific PE funds are particularly good at timing the markets. Table 2 shows that we have detailed information about 1,571 individual funds which are involved in 4,293 deals

or 80% of our deal sample. The 1,571 funds are, on average, involved in 2.7 deals each. On average, 1.1 funds are involved in a deal. The fund information is derived from Preqin, so we can easily link deal-level information to fund-level information.

The majority of our funds are classic buyout funds (72%), as we focus our analysis on buyout deals. 26% are other types of funds (often classified as venture funds). The fund focus of the majority of deals is North America (57%). Previous studies have discussed the correlation between fund size and fund performance (see, e.g., Jones and Rhodes-Kropf (2003), Phalippou and Gottschalg (2009)). Hence, we also consider fund size as a characteristic for our analysis (USD 1,133 million on average). Phalippou and Gottschalg (2009) use fund sequence as an indicator for fund experience and Kaplan and Schoar (2005) include fund sequence in their basic empirical specification of the PME. We follow their example and also use fund sequence as an indicator for fund experience.[12] The average fund sequence number is 2.5. Phalippou and Gottschalg (2009) compute an average fund sequence of 3.0 in their base deal sample and 2.4 in an additional sample of funds which come from a different source than their base case. The average fund age at investment is 1.8 years and 6.1 years at exit. The average net IRR of our PE funds in scope is 15.1%. Harris *et al.* (2016) report an average net IRR of 15.7% for buyout funds in 1984 to 2010.

[Insert Table 2 about here]

5 Empirical Results

Table 3 presents evidence on market timing ability based on the three different benchmark multiples (transaction multiples (Panel A), trading multiples (Panel B), and trading multiples plus transaction premiums (Panel C)). As part of our identification strategy, we group each of the three benchmark types into four variations which apply different matching criteria: variation (i) benchmarks PE deals against the whole strategic deal market in a given quarter of a given year, variation (ii) benchmarks against a specific region in a given quarter of a given year, variation (iii) benchmarks against a specific industry in a given quarter of a given year, and variation (iv) benchmarks against a specific region and a specific industry in a given quarter of a given year.[13] This means that we conduct the market timing analysis using 12 benchmarks and 10 out of these 12 variations support the hypothesis that fund managers create value by selling when market multiples are higher than at the time of investment.

[12] We compute the fund sequence number manually based on fund manager, fund type, fund focus, and fund vintage year.

[13] All multiples in the sample are winsorized at the 1% level.

Given that PE funds take controlling stakes in companies, arguably the most relevant benchmark is the set of transaction multiples that are benchmarked against transaction time, target region, and target industry (variation (iv) of Panel A). This variation (iv) allows us to compare marketing timing ability of PE funds managers against the entire M&A market with high precision. Based on 2,867 observations[14], we find that the average difference between market multiples at exit and market multiples at investment in this reference group is 0.5 (median: 0.4). This difference is significant at the 1% level. The high standard deviation of 5.6 and the 25th percentile threshold at -2.2 and the 75th percentile threshold at 3.2 suggest that market timing abilities vary widely. Assuming a median enterprise value at investment of USD 306 million for PE deals and a median EBITDA of USD 34 million,[15] the average multiple increase of 0.5 would result in an enterprise value at exit of USD 323 million; this equals an increase in enterprise value of USD 17 million through market timing alone.[16]

Panel B reveals the same analysis with trading multiples. In line with Panel A, it shows evidence for managers' market timing abilities but to a lesser extent (although also statistically strongly significant). The reason for the smaller magnitude of the results in Panel B is that the trading multiples are less volatile than the transaction multiples and the deltas between investment and exit multiples are therefore less pronounced. Arguably, the lower observed volatility comes from the larger volume of data behind each period's average trading multiple. The transaction premium that we add to the trading multiples lifts the average and the median market timing from 0.1 to 0.3 (Panel C). The transaction premium ensures a fairer comparison of transaction and trading multiples (see Appendix 1).

Overall, the statistically significant deltas between investment and exit multiples across all three panels are evidence to suggest that the PE funds advantage of their freedom to time investments and exits allows them to benefit from market cycles.

[Insert Table 3 about here]

Figure 1 shows the market timing of PE deals linked to their investment and exit dates. Figure 1A shows that investments made between 1998 and 2012 lead to market multiple expansion ranging between -2 and +2.5.[17] There is a slight dip in the year 2000 (dotcom bubble) and a major

[14] We lose observations compared with (i)-(iii) as we require at least five observations for a benchmark group (e.g., Q1 2000-Materials-North America) to be taken into account in our analysis.

[15] These estimations are taken from Morkoetter and Wetzer (2016) as Preqin reports few data points on target financials.

[16] For simplification, this estimation assumes that the target's EBITDA remains constant.

[17] The year 2013 is excluded as only very few investments were made in 2013 and exited in the same year.

dip in 2006 and 2007 (before the financial crisis). The graph suggests that funds that invest in overvalued markets will sell their portfolio companies with a discount as they pay too much at investment. Figure 1B maps market timing to exit dates. Complementing the findings on the investment side, companies which exited in the years prior to the dotcom bubble in 2000 and 2001 and prior to the financial crisis in 2008 to 2010 actually benefit from increasing valuation levels as the corresponding exits took place in an environment of high valuations. The graph also illustrates a dip in 2001 to 2003 (after the burst of the dotcom bubble) and an even more severe one in 2009 (financial crisis) when valuations slumped.

For the remainder of this paper we will base our analysis on transaction multiples benchmarked against transaction time, target industry, target region (as shown in the principle benchmark variation (iv) of Table 3 Panel A and as represented by the blue line in Figure 1).

[Insert Figure 1 about here]

Next, we consider timing ability by PE firms. For the 10 top-tier PE firms (defined by total funds raised in the last 10 years),[18] we find that market timing ability does not necessarily correlate with fund raising abilities (Table 4). On the contrary, the market timing of top-tier PE firms is not statistically significant (0.4) while it is significant for non-top-tier PE firms (0.6***). However, there is considerable variation in average market timing across the group of top GPs. For Apax Partners, Apollo Global Management, Goldman Sachs, and Warburg Pincus, for their deals in our sample, market multiples are on average lower at the time of exit than at the time of investment. In contrast, for Bain Capital, TPG Capital, Blackstone, and CVC transaction multiples at exit are on average higher than at entry. Overall, only the results for Bain Capital, CVC, and Apax Partners are statistically significant.

The picture looks different when we weight market timing by exit deal size: then top-tier market timing abilities tend to outshine the abilities of non-top-tier firms (1.2 vs. 0.4), but the difference is not statistically significant.

[Insert Table 4 about here]

Therefore, observed market timing ability of all PE firms shows a high degree of dispersion. We next seek to better understand what drives the market timing of fund managers – both on the deal level and on the fund level.

[18] We obtain data on PE fund raising from Preqin. Total funds raised in the last 10 years cover the time period January 1, 2004 to December 31, 2013.

In Panel A of Table 5, we focus on deal-level characteristics to investigate whether PE funds are able to time the markets independent of the type of deal. By taking subsamples of the deal characteristics we find that most of the subsamples are indeed statistically significant; with a few exceptions: market timing is not apparent in growth investments or in smaller investments. In trade sales, demand is often triggered by the buying party. This might be the reason why fund managers seem to find it hard to time the markets in such sales. However, secondary sales and IPOs have similar average market timing characteristics. In that sense our results are in line with Phalippou and Gottschalg (2009) who show no significant difference between the impact of IPOs and trade sales on fund performance. As established earlier, multiples oscillate more strongly in North America (see Appendix 2A) but this does not seem to lead to significantly stronger market timing compared with deals in Europe (the difference between the two subsamples is insignificant). Puche *et al.* (2015) also find that the multiple effect is about as strong in North America as it is in Europe.

Panel B of Table 5 focuses on the impact of fund-level characteristics on market timing. It suggests that market timing is mainly achieved by buyout funds and in deals that invest at a later stage of the fund's investment period. Kaplan and Schoar (2005) find that larger funds and funds with higher sequence numbers achieve higher PMEs. In our study, we observe that market timing does not depend on the fund sequence number (i.e., experience): market multiple expansion is significant in all subsamples. Also, market timing is pronounced both in low fund target sizes (below the median of USD 400mn) and high fund target sizes (above the median of USD 400mn).

[Insert Table 5 about here]

Tables 4 and 5 and Figure 1 provided empirical evidence that PE fund managers, on average, time the markets and achieve market multiple expansion. However, what we do not know yet is whether the fund managers who time the markets do so by timing their investments and their exits, or whether they only time either investments or exits. It would be more convincing evidence of market timing skills if fund managers systematically time the markets at investment and at exit. Also, it would be in line with Achleitner et al. (2011) who argue that it requires skill and not luck to time the markets. We use the investment and exit timing model which we introduce in Section 3.2 to address this question and investigate whether PE funds strategically choose the right quarter to buy/ sell their portfolio companies. According to equation 3.4, fund managers who time the markets at investment buy when market multiples are lower than the average multiples in the investment period (18 months/6 quarters before and after the investment). According to equation

3.5, fund managers who time the markets at exit sell when market multiples are higher than the average multiples in the exit period (18 months/6 quarters before and after the exit).

The first row of Table 6A shows that, when looking at our full sample, PE funds tend to buy their portfolio companies in a phase when market multiples are 1.2% higher than the average multiples in the investment period. This result is statistically but only marginally economically significant. The average PE fund does not time the markets at investment. Market timing winners (PE funds that sell when multiples are higher than at the time of investment), however, buy when market multiples are on average 14% lower than the average multiples in the investment period. Winners time the markets at investment at a statistically and economically significant level. Market timing losers (PE funds that sell when multiples are lower than at the time of investment), on the other hand, do exactly the opposite: they buy when market multiples are significantly higher (19% on average) than average market multiples in the investment period. Table 6A shows that, when taking the full sample of PE funds, investment market timing is largely insignificant no matter the deal and fund characteristics. When only focusing on market timing winners, all subsamples are significantly negative and when focusing on market timing losers they are significantly positive. In unreported analyses, we see that the differences between the subsamples are insignificant. Deal and fund characteristics do not influence the investment market timing of PE funds.

The exit side shows a similar picture (Table 6B): the whole sample of PE funds sells the portfolio companies in quarters when market multiples are only 2.6% higher than average market multiples in the exit period (which is evidence for some marginal but statistically significant exit market timing). Winners, however, sell when multiples are 14% higher and losers sell when multiples are 13% lower than average market multiples. There is no consistent pattern which deal and fund characteristics drive exit market timing but results are more significant for the full sample of PE fund managers than in the analysis of investment market timing (see Table 6A).

We additionally check in a multivariate setting whether the type of exit (IPO, trade sale, or secondary) has any impact on investment and exit timing (Appendix 5). This analysis is related to Jenkinson and Sousa (2015), who find that PE funds wait for the right opportunity to go public. We observe that PE funds time their exits in all three major exit types: the better the investment and exit timing the more positive the delta between investment and exit market multiples. The economic magnitude of all results is similar.

[Insert Table 6 about here]

Clearly, some managers will succeed in timing investment, but fail at exit and vice versa. To analyze the importance of each stage, in Table 7 we calculate the market multiple expansion

that PE fund managers achieve when they: (i) time the markets at investment and at exit, (ii) time the markets at investment but not at exit, (iii) do not time the markets at investment but at exit, and (iv) time the markets neither at investment nor at exit. The PE funds in the 353 deals that time the market at investment and at exit (27% of all deals in the sample of this analysis[19]) achieve a significant average market multiple expansion of 5.4. Losers at investment and at exit (25% of all deals), on the other hand, achieve a significantly negative delta of -4.5.

[Insert Table 7 about here]

Finally, the analysis to this point has defined and quantified market timing ability in terms of market multiple expansion. However, what impact does market timing have on overall fund performance, as measured by IRRs, according to our data? Our final analysis calculates the contribution of market timing to the overall fund net IRRs by fund vintage year in our North American and European deal sample (Figure 2). For this we compute our own market timing IRR by dividing market multiples at exit by market multiples at investment and comparing this to the portfolio company holding period.[20] This approach is based on Graf *et al.* (2012). The analysis suggests that market timing makes up 16% of overall value creation, but with large fluctuations from 26% for funds with vintage year 2003 to nearly 0% for funds with vintage years 2005 and 2009.[21] The contribution of market timing to the overall net IRR seems to have gone down in recent years according to our data. Our analysis suggests that the contribution of market timing to the overall value creation is slightly lower than the 20% that Guo *et al.* (2011) find in their smaller sample that focuses on US acquisitions.

[Insert Figure 2 about here]

It is important to note that the analysis in Figure 2 is an estimation as not all the deals that make up the funds' net IRRs are included in our data sample. For simplification, we assume that the deals' market timing IRRs that we calculate represent an average of all the deals' market timing IRRs in the respective funds. This simplification might also be the reason why the correlation between our calculated market timing IRRs and the funds official net IRRs is relatively low at 0.2.

[19] The number of deals in this analysis is lower than the number of deals in the previous analysis (e.g., Table 6). The reason is that for the analysis in Table 7, we need to know for each deal: (i) the market multiple expansion, (ii) the market timing at investment, and (iii) the market timing at exit.

[20] ((Exit market multiple/investment market multiple)^(1/holding period))–1.

[21] There are only very few data points for funds with vintage years later than 2009. This is why we exclude them from the sample.

6 Conclusion

Building on the existing literature that investigates PE performance and suggests that PE funds create value through multiple expansion, we shed light on the ability of PE funds to systematically create value specifically through market timing. We do this by analyzing a PE fund's ability to time the overall capital market environment during investments and exits – independent of transaction-specific pricing levels.

Our data show that PE funds sell their portfolio companies when market multiples are higher than at the time of investment. This results in an average market multiple expansion of 0.5. The results are statistically significant and provide empirical evidence that market timing does matter for PE funds. The market timing abilities are largely consistent among PE fund managers when controlling for deal and fund level characteristics. The funds of top-tier PE firms with large amounts of total funds raised in recent years are not noticeably more successful at market timing than the funds of smaller, non-top-tier PE firms. Successful market timing requires good timing at entry and exit, which is achieved by around 30% of the deals in our sample. Overall, our results suggest that market timing comprises 16% of overall fund performance.

References

Achleitner, A.-K., Braun, R., Engel, N., 2011. Value creation and pricing in buyouts: Empirical evidence from Europe and North America. Review of Financial Economics 20, 146-161

Agarwal, V., Ruenzi, S., Weigert, F., 2015. Tail risk in hedge funds: A unique view from portfolio holdings. Available at SSRN 2517799

Bodnaruk, A., Chokaev, B., Simonov, A., 2015. Downside risk timing by mutual funds. Available at SSRN 2654055

Bollen, N.P., Busse, J.A., 2001. On the timing ability of mutual fund managers. The Journal of Finance 56, 1075-1094

Cao, C., Chen, Y., Liang, B., Lo, A.W., 2013. Can hedge funds time market liquidity? Journal of Financial Economics 109, 493-516

Cao, J., Lerner, J., 2009. The performance of reverse leveraged buyouts. Journal of Financial Economics 91, 139-157

Cao, J.X., 2011. IPO timing, buyout sponsors' exit strategies, and firm performance of RLBOs. Journal of Financial and Quantitative Analysis 46, 1001-1024

Chang, E.C., Lewellen, W.G., 1984. Market timing and mutual fund investment performance. Journal of Business, 57-72

Chen, C.R., Lee, C.F., Rahman, S., Chan, A., 1992. A cross-sectional analysis of mutual funds' market timing and security selection skill. Journal of Business Finance & Accounting 19, 659-675

Chen, Y., Liang, B., 2007. Do market timing hedge funds time the market? Journal of Financial and Quantitative Analysis 42, 827-856

Coggin, T.D., Fabozzi, F.J., Rahman, S., 1993. The investment performance of US equity pension fund managers: An empirical investigation. The Journal of Finance 48, 1039-1055

Cumby, R.E., Glen, J.D., 1990. Evaluating the performance of international mutual funds. The Journal of Finance 45, 497-521

Fletcher, J., 1995. An examination of the selectivity and market timing performance of UK unit trusts. Journal of Business Finance & Accounting 22, 143-156

Gredil, O., Griffiths, B., Stucke, R., 2014. Benchmarking private equity: The direct alpha method. Available at SSRN 2403521

Graf, C., Kaserer, C., Schmidt, D., 2012. Private equity: Value creation and performance. The Oxford Handbook of Private Equity, 347

Griffin, J.M., Xu, J., 2009. How smart are the smart guys? A unique view from hedge fund stock holdings. Review of Financial Studies 22, 2531-2570

Grinblatt, M., Titman, S., 1989. Mutual fund performance: An analysis of quarterly portfolio holdings. Journal of Business, 393-416

Guo, S., Hotchkiss, E.S., Song, W., 2011. Do buyouts (still) create value? The Journal of Finance 66, 479-517

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

Harris, R.S., Jenkinson, T., Kaplan, S.N., 2016. How do private equity investments perform compared to public equity? Journal of Investment Management 14, 1-24

Henriksson, R.D., 1984. Market timing and mutual fund performance: An empirical investigation. Journal of Business 57, 73-96

Henriksson, R.D., Merton, R.C., 1981. On market timing and investment performance. II. Statistical procedures for evaluating forecasting skills. Journal of Business 54, 513-533

Jenkinson, T., Sousa, M., 2015. What determines the exit decision for leveraged buyouts? Journal of Banking & Finance 59, 399-408

Jones, C.M., Rhodes-Kropf, M., 2003. The price of diversifiable risk in venture capital and private equity. Unpublished working paper, Columbia University

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

Leleux, B., van Swaay, H., Megally, E., 2015. Private Equity 4.0: Reinventing Value Creation. Wiley Finance Series.

Lerner, J., 1994. Venture capitalists and the decision to go public. Journal of Financial Economics 35, 293-316

Leslie, P., Oyer, P., 2008. Managerial incentives and value creation: Evidence from private equity. National Bureau of Economic Research

Ljungqvist, A., Richardson, M., 2003a. The cash flow, return and risk characteristics of private equity. National Bureau of Economic Research

Ljungqvist, A., Richardson, M.P., 2003b. The investment behavior of private equity fund managers. Available at SSRN 1297781

Long, A.M., Nickels, C.J., 1996. A private investment benchmark. In: Proceedings of Conference on Venture Capital Investing System, Texas University

Merton, R.C., 1981. On market timing and investment performance. I. An equilibrium theory of value for market forecasts. Journal of Business 54, 363-406

Morkoetter, S., Wetzer, T., 2016. Do private equity funds always pay less? A synergy-related explanation based on add-on acquisitions. Available at SSRN 2679186

Pástor, Ľ., Taylor, L.A., Veronesi, P., 2009. Entrepreneurial learning, the IPO decision, and the post-IPO drop in firm profitability. Review of Financial Studies 22, 3005-3046

Phalippou, L., Gottschalg, O., 2009. The performance of private equity funds. Review of Financial Studies 22, 1747-1776

Puche, B., Braun, R., 2016. Deal pricing and returns in private equity. Available at SSRN 2705504

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

Robinson, D.T., Sensoy, B.A., 2011. Cyclicality, performance measurement, and cash flow liquidity in private equity. National Bureau of Economic Research

Sørensen, M., Jagannathan, R., 2013. The public market equivalent and private equity performance. Columbia Business School Research Paper

Volkman, D.A., 1999. Market volatility and perverse timing performance of mutual fund managers. Journal of Financial Research 22, 449-470

Wermers, R., 2000. Mutual fund performance: An empirical decomposition into stock-picking talent, style, transactions costs, and expenses. The Journal of Finance 55, 1655-1703

Tables and Figures

Table 1: Deal summary statistics
Table 1 shows summary statistics of all 5,366 PE deals for which we have investment and exit information between 1998 and 2013 (number of observations, distribution, mean, median, standard deviation, 5th percentile threshold, 95th percentile threshold). Exit information is available for 6,142 PE deals as we have partial exits for about 30% of the deals. PE deal information comes from Preqin.

Deal characteristics	n	%	Mean	Median	Std Dev	p5	p95
Investments	5,366	*100%*					
Investment types							
Buyout	4,043	*75%*					
Growth	656	*12%*					
Other (e.g., PIPE, special situations)	667	*12%*					
Investment years							
<2000	724	*13%*					
2000-2004	1,814	*34%*					
2005-2009	2,459	*46%*					
2010-2013	369	*7%*					
Investment regions							
North America	2,920	*54%*					
Europe	2,446	*46%*					
Club deals							
Yes	866	*16%*					
No	4,500	*84%*					
Investment size (USD mn)	2,074		566	125	1,857	8	2,050
Exit types							
IPO	454	*7%*					
Trade Sale	2,752	*45%*					
Secondary	1,992	*32%*					
Other (e.g., private placements)	944	*15%*					
Exit years							
<2000	128	*2%*					
2000-2004	651	*11%*					
2005-2009	2,335	*38%*					
2010-2013	3,028	*49%*					
Partial exits							
No	4,317	*70%*					
Yes	1,825	*30%*					
Exits per investment	6,142		1.4	1.0	1.0	1.0	3.0
Holding period (years)	6,142		4.5	4.2	2.5	1.3	8.7
Exit size (USD mn)	1,639		504	247	768	23	1,900

Table 2: Fund summary statistics

Table 2 shows information on the 1,571 individual PE funds that we have in our database (number of observations, distribution, mean, median, standard deviation, 5th percentile threshold, 95th percentile threshold). These 1,571 deals are involved in 2.7 deals on average (4,293 deals in total). The majority of our funds are buyout funds. All fund information comes from Preqin.

Fund characteristics	n	%	Mean	Median	Std Dev	p5	p95
Funds	1,571						
Funds per deal	4,293		1.1	1.0	0.3	1.0	2.0
Fund types							
Buyout	1,136	72%					
Venture & Other	401	26%					
Unknown	34	2%					
Fund focus regions							
North America	893	57%					
Europe	492	31%					
RoW	152	10%					
Unknown	34	2%					
Fund target size (USD mn)	840		1,133	400	2,148	70	5,000
Fund sequence number	1,530		2.5	2.0	2.2	1.0	6.0
Fund age @ investment (years)	4,143		1.8	1.0	1.6	0.0	5.0
Fund age @ exit (years)	4,227		6.1	6.0	2.7	2.0	11.0
Net IRR (%)	837		15.1	12.8	15.3	-4.1	42.0

Table 3: Market timing by benchmarking type

Table 3 is our main table to show (in a univariate setting) whether PE funds time the markets. We show statistics (mean, median, etc.) for the deltas between investment and exit market multiples. The difference of the means from zero is verified through t-tests. We show results of four benchmark variations ((i) to (iv)) and three different types of market multiples (Panel A: transaction multiples; Panel B: trading multiples; Panel C: trading multiples + transaction premium). Thus, we show market timing in 12 different variations. All deltas are winsorized at the 1% level.

PANEL A: TRANSACTION MULTIPLES BENCHMARK							
	Mean	**t-Test**	**Median**	**Std Dev**	**p25**	**p75**	**n**
(i) Benchmark: Market	0.1	***	0.2	1.8	-0.9	1.2	5,149
(ii) Benchmark: Region	0.1	**	0.0	2.3	-1.5	1.7	5,143
(iii) Benchmark: Industry	0.4	***	0.5	4.1	-1.8	2.7	4,639
(iv) Benchmark: Region & Industry	**0.5**	***	**0.4**	**5.6**	**-2.2**	**3.2**	**2,867**

PANEL B: TRADING MULTIPLES BENCHMARK							
	Mean	**t-Test**	**Median**	**Std Dev**	**p25**	**p75**	**n**
(i) Benchmark: Market	0.1	***	0.0	1.3	-0.8	1.0	4,932
(ii) Benchmark: Region	0.1	***	0.1	1.6	-0.9	1.2	4,932
(iii) Benchmark: Industry	-0.1	**	0.0	1.7	-1.1	1.1	4,932
(iv) Benchmark: Region & Industry	**0.1**	***	**0.1**	**1.8**	**-1.1**	**1.4**	**4,585**

PANEL C: TRADING MULTIPLES BENCHMARK + TRANSACTION PREMIUM							
	Mean	**t-Test**	**Median**	**Std Dev**	**p25**	**p75**	**n**
(i) Benchmark: Market	0.2	***	0.2	1.8	-0.9	1.3	4,720
(ii) Benchmark: Region	0.1	***	0.3	2.4	-1.1	1.7	4,688
(iii) Benchmark: Industry	0.0		0.1	2.3	-1.4	1.5	4,688
(iv) Benchmark: Region & Industry	**0.3**	***	**0.3**	**2.5**	**-1.3**	**2.1**	**4,342**

Figure 1: Market timing by investment and exit year

Figure 1 shows the deltas between investment and exit market multiples from 1998 to 2012. We show four variations of market multiple benchmarks: (i) transaction time, (ii) transaction time and the target region, (iii) transaction time and target industry, and (iv) transaction time, target industry, target region. Figure 1A shows the deltas of PE deals mapped to the investment dates of these deals. The green bars represent the number of corresponding investments. Figure 1B maps market timing to exit dates. The green bars represent the number of corresponding exits.

Figure 1A: Investments

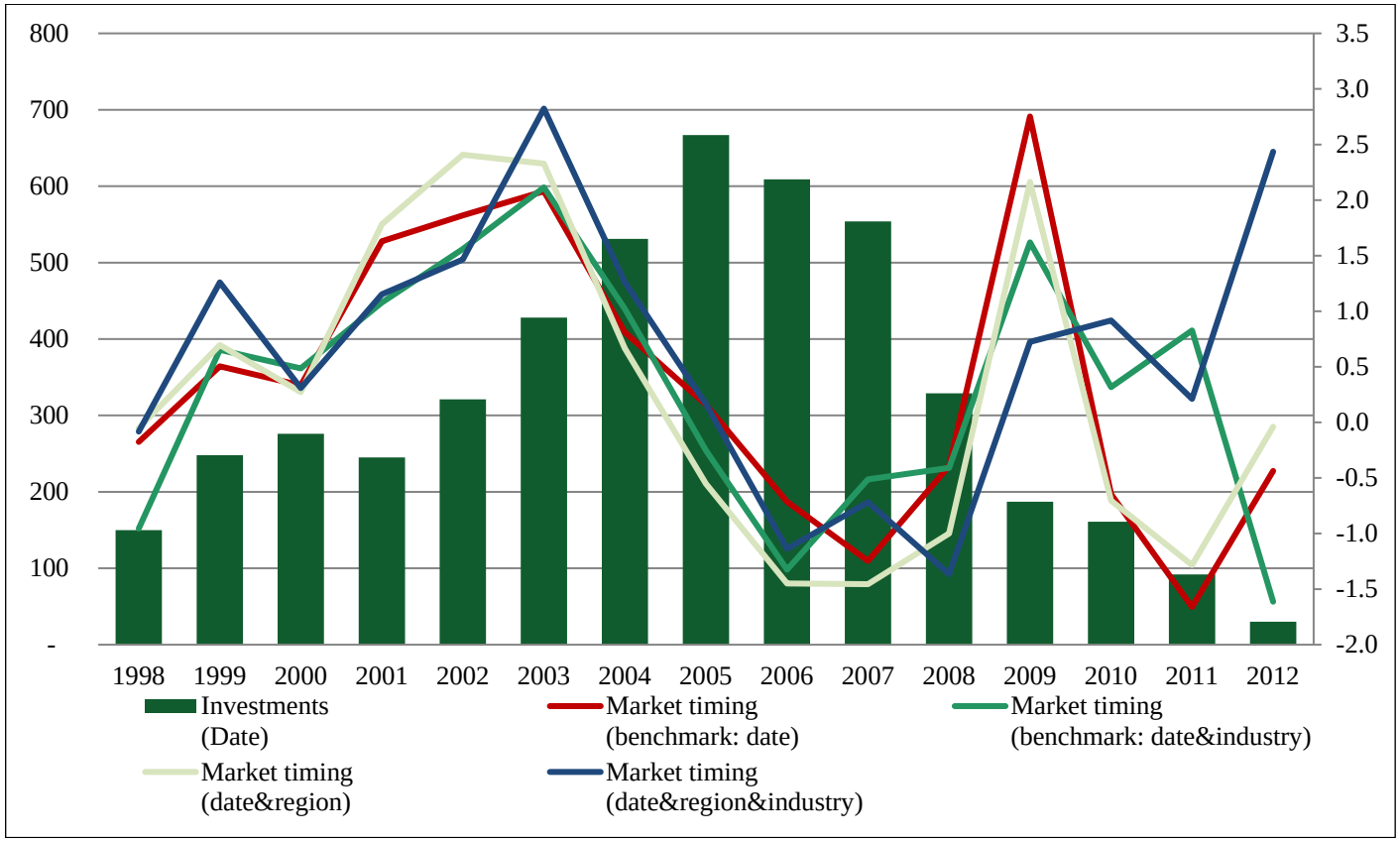


Figure 1B: Exits

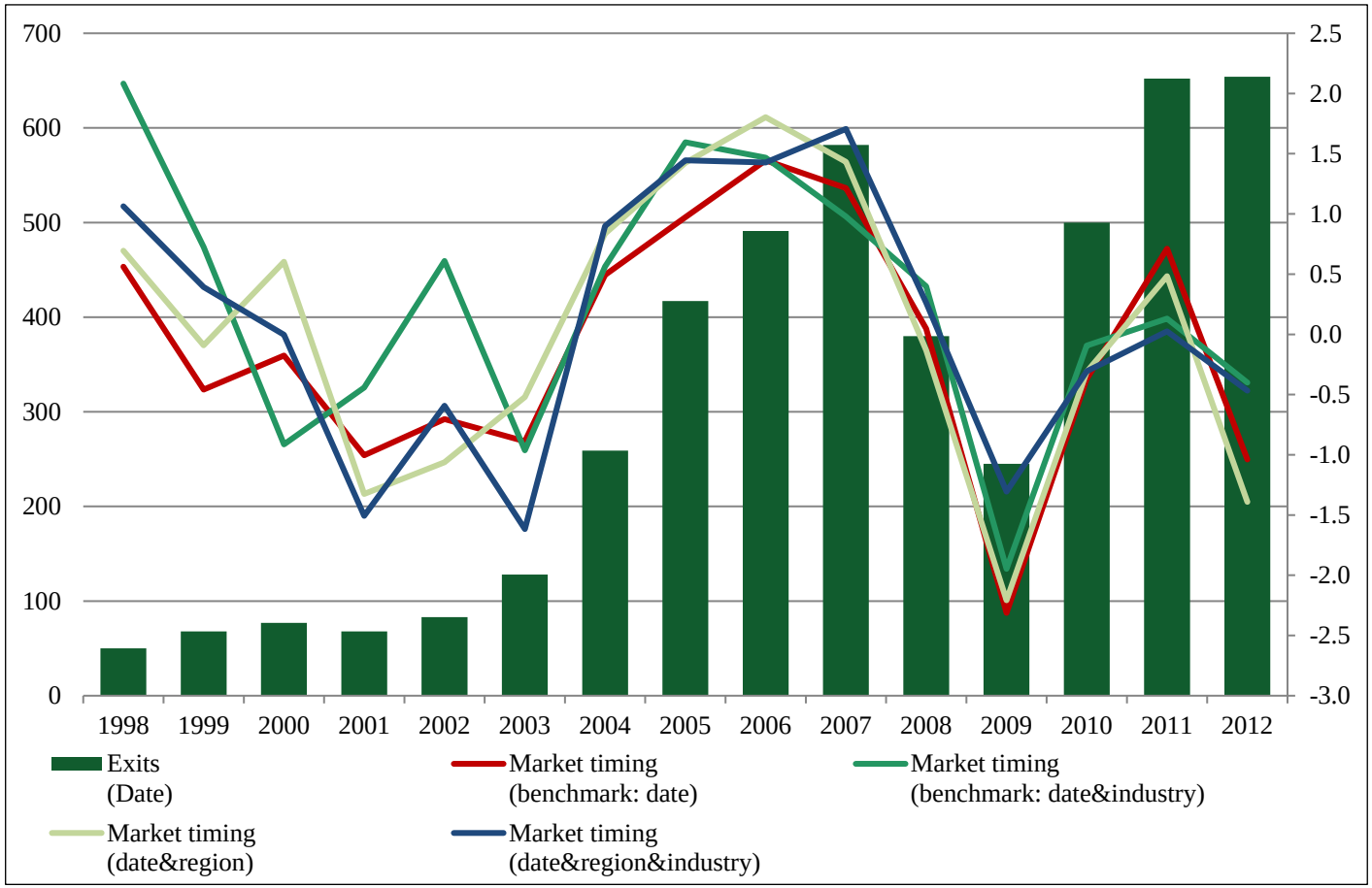


Table 4: Market timing of top-tier PE firms

Table 4 shows the average market timing performance (based on our principal benchmark which uses investment date, target industry, and target region as matching criteria) of the 10 top-tier PE firms according to total funds raised (in USD) in the last 10 years. Total funds raised in the last 10 years cover the time period January 1, 2004 to December 31, 2013. These total funds raised range from USD 31.9 billion to USD 64.2 billion. We also list the market timing performance of these top-tier PE firms weighted by exit deal size. The last row lists the market timing performance of non-top-tier PE firms (i.e., all remaining PE firms). The difference of the means from zero is verified through t-tests. Market timing figures are winsorized at the 1% level.

#	Top-tier PE firms	Market timing	Market timing (weighted by exit deal size)	Total funds raised last 10 yrs (USD bn)	Number of deals involved in
1	**Bain Capital**	4.4**	5.2	37.2	16
2	**TPG Capital**	1.6	2.0	53.8	26
3	**The Blackstone Group**	1.3	3.5	41.9	35
4	**CVC Capital Partners**	1.0**	1.1	48.5	29
5	**KKR**	0.5	1.3	60.7	24
6	**The Carlyle Group**	0.0	0.6	64.2	75
7	**Warburg Pincus**	-0.1	0.7	34.2	23
8	**Goldman Sachs**	-0.5	1.3	52.2	13
9	**Apollo Global Management**	-0.8	-3.6	53.6	13
10	**Apax Partners**	-3.4**	0.0	31.9	26
	AVERAGE (top-tier)	**0.4**	**1.2**	**47.8**	**28.0**
	AVERAGE (non-top-tier)	**0.6*** **	**0.4**	**3.7**	**3.4**

Table 5: Market timing by deal and fund characteristics

Table 5 shows descriptive information on the market timing performance (based on our principal benchmark which uses investment date, target industry, and target region as matching criteria) split by deal characteristics (Panel A) and fund characteristics (Panel B). The difference of the means from zero is verified through t-tests. Market timing figures are winsorized at the 1% level.

	Market timing					
Fund and deal characteristics	**Mean**	**Median**	**Std Dev**	**p25**	**p75**	**n**
ALL	**0.5*** **	0.4	5.6	-2.2	3.2	2,867
PANEL A						
Regions						
North America	**0.7*** **	0.5	6.7	-2.8	4.2	1,380
Europe	**0.4*** **	0.3	4.5	-1.8	2.5	1,487
Investment types						
Buyout	**0.5*** **	0.4	5.4	-2.1	3.1	2,156
Growth	**0.5**	0.5	6.3	-2.4	3.7	358
Other	**0.8** **	0.2	6.2	-2.6	3.3	353
Exit types						
IPO	**0.8** **	0.6	5.8	-2.4	3.4	274
Trade Sale	**0.3** **	0.2	6.0	-2.5	3.2	1,442
Secondary	**0.7*** **	0.5	5.0	-1.8	3.0	1,024
Other	**0.3**	0.2	5.9	-2.5	2.9	489
Partial exits						
No	**0.5*** **	0.4	5.7	-2.2	3.1	2,361
Yes	**0.4** **	0.2	5.7	-2.4	3.0	868
Investment size (USD mn)						
< median (125)	**0.5***	0.5	6.1	-2.1	3.5	564
> median (125)	**0.9*** **	0.5	5.3	-1.9	3.4	556
Holding period (years)						
< median (4.2)	**0.6*** **	0.4	5.7	-2.2	3.1	1,447
> median (4.2)	**0.5*** **	0.4	5.6	-2.2	3.2	1,420
PANEL B						
Fund type: Buyout						
Buyout	**0.6*** **	0.5	5.5	-2.1	3.3	1,809
Venture	**0.4**	-0.1	6.0	-2.0	2.8	86
Other	**-0.1**	-0.2	5.7	-3.2	2.4	199
Fund age @ investm. (years)						
< median (1.0)	**0.4**	0.3	5.6	-2.4	2.8	554
> median (1.0)	**0.6*** **	0.4	5.5	-2.1	3.3	1,611
Fund age @ exit (years)						
< median (6.0)	**0.6*** **	0.4	5.4	-2.2	3.1	1,069
> median (6.0)	**0.5*** **	0.4	5.6	-2.1	3.2	1,136
Fund sequence number						
< median (2.0)	**0.7*** **	0.8	5.5	-1.8	3.4	786
> median (2.0)	**0.4*** **	0.3	5.5	-2.3	3.0	1,415
Fund target size (USD mn)						
< median (400)	**0.5** **	0.4	4.9	-1.8	2.7	466
> median (400)	**0.5*** **	0.4	5.4	-2.3	3.1	670

Table 6: Investment and exit timing by deal and fund characteristics

Table 6 splits the investment and exit market timing performance by deal (Panel A) and fund (Panel B) characteristics and creates subsamples for market timing winners (PE funds that sell their portfolio companies when market multiples are higher than the time of investment) and for market timing losers (PE funds that do not sell their portfolio companies when market multiples are higher than the time of investment). Observations of winners (investments: 1,162/exits: 875) plus losers (927/591) are less than total observations (2,685/1,612) as we do not need to know the market timing for the latter (which we do not have for all PE deals). The difference of the means from zero is verified through t-tests. Market timing figures are winsorized at the 1% level.

Table 6A: Investment market timing

	Investment market timing								
Deal and fund characteristics	**Total**	**Std Dev**	**n**	**Winners**	**Std Dev**	**n**	**Losers**	**Std Dev**	**n**
All	1.2**	29.7	2,685	-13.8***	18.5	1,162	19.2***	32.6	927
PANEL A									
Regions									
North America	1.6	32.5	1,017	-14.5***	19.4	421	22.0***	36.9	336
Europe	0.9	27.8	1,668	-13.6***	17.9	741	17.5***	29.8	591
Investment types									
Buyout	1.1*	29.2	2,056	-13.5***	18.0	891	18.9***	32.0	714
Growth	1.1	33.5	327	-16.6***	21.1	149	21.0***	37.7	106
Other	1.8	28.5	302	-13.3***	18.3	122	18.9***	31.6	107
Exit types									
IPO	1.9	33.8	230	-15.5***	18.6	110	25.0***	38.7	80
Trade Sale	1.3	29.9	1,332	-14.3***	18.8	555	20.2***	33.3	491
Secondary	-0.7	27.5	1,026	-13.7***	17.6	446	15.4***	29.1	313
Other	2.8*	32.4	485	-15.0***	18.4	189	21.9***	32.5	161
Partial exits									
No	1.3**	29.8	2,234	-13.7***	18.4	975	19.2***	32.7	780
Yes	-0.2	30.2	839	-16.2***	17.8	325	19.8***	32.1	265
Investment size (USD mn)									
< median (125)	2.6*	32.1	542	-14.0***	20.1	234	19.9***	35.0	193
> median (125)	-1.4	27.2	552	-15.0***	17.4	251	17.3***	30.2	173
Holding period (days)									
< median (4.2)	1.6*	30.0	1,133	-13.6***	19.3	523	17.9***	31.9	459
> median (4.2)	0.8	29.4	1,552	-14.2***	17.8	639	20.4***	33.3	468
PANEL B									
Fund type: Buyout									
Buyout	-0.2	28.3	1,699	-14.3***	18.3	737	17.5***	30.6	569
Venture	2.8	29.8	80	-12.6***	22.5	31	16.9**	34.4	31
Other	3.6	31.1	166	-12.8***	17.9	68	16.4***	33.1	66
Fund age @ investm. (years)									
< median (1.0)	1.4	29.7	534	-12.9***	20.0	230	18.1***	32.4	182
> median (1.0)	0.2	28.5	1,469	-14.4***	17.8	626	17.7***	31.0	504
Fund age @ exit (years)									
< median (6.0)	0.1	29.3	858	-14.8***	19.1	398	16.8***	31.3	334
> median (6.0)	0.5	28.3	1,189	-13.6***	17.7	477	18.8***	31.4	363
Fund sequence									
< median (2.0)	0.1	29.4	718	-15.3***	17.5	328	17.9***	32.5	254
> median (2.0)	0.5	28.4	1,322	-13.3***	18.9	548	17.8***	30.7	441
Fund Target Size (USD mn)									
< median (400)	-1.2	26.5	448	-15.9***	15.4	185	12.8***	25.3	145
> median (400)	-0.7	27.7	605	-14.2***	19.0	252	15.9***	28.5	193

Table 6B: Exit market timing

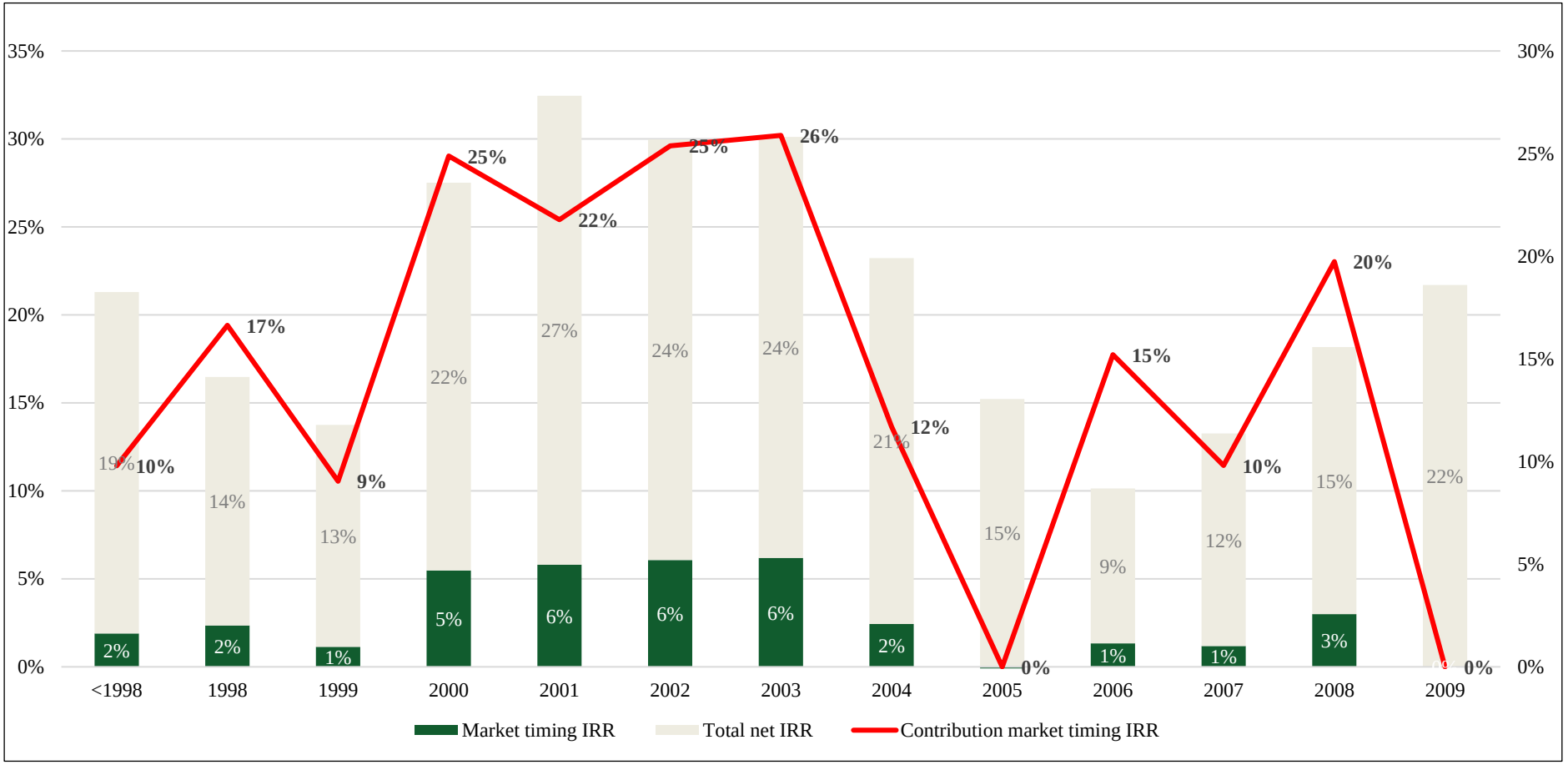
Deal and fund characteristics	Exit market timing								
	Total	Std Dev	n	Winners	Std Dev	n	Losers	Std Dev	n
All	2.6***	27.7	1,612	13.9***	27.6	875	-13.4***	19.9	591
PANEL A									
Regions									
North America	2.5*	30.6	537	16.3***	31.4	265	-15.6***	21.7	199
Europe	2.6***	26.1	1,075	12.3***	25.7	610	-12.8***	18.9	392
Investment types									
Buyout	2.5***	27.4	1,255	13.4***	27.5	682	-13.8***	19.6	462
Growth	1,6	29.2	203	14.6***	28.6	108	-17.3***	20.4	70
Other	4.4*	28.1	154	14.3***	27.7	85	-9.3***	21.7	59
Exit types									
IPO	-0.9	27.4	173	8.1***	26.5	90	-11.9***	21.4	73
Trade Sale	2.4**	28.5	791	13.2***	28.4	408	-12.7***	22.7	301
Secondary	2.1*	26.0	549	11.7***	25.7	324	-14.3***	17.9	176
Other	5.1**	30.2	249	17.7***	29.2	133	-14.4***	19.1	97
Partial exits									
No	2.6***	27.9	1,362	13.6***	27.7	735	-14.1***	19.9	492
Yes	1.3	27.8	400	10.0***	26.9	220	-10.7***	23.3	155
Investment size (USD mn)									
< median (125)	3.2**	28.0	365	15.5***	26.6	198	-12.5***	22.3	133
> median (125)	2.3	26.5	306	13.0***	26.0	176	-15.9***	17.3	106
Holding period (days)									
< median (4.2)	2.7***	28.2	928	15.4***	28.0	489	-14.3***	19.6	350
> median (4.2)	2.4**	27.0	684	11.2***	27.0	386	-13.0***	20.3	241
PANEL B									
Fund type: Buyout									
Buyout	3.0***	27.5	1,018	14.0***	27.8	573	-13.7***	18.6	349
Venture	-1.2	27.4	40	13.3**	26.0	21	-17.3***	19.1	19
Other	-5.0**	21.3	90	8.0**	20.5	42	-17.2***	13.1	46
Fund age @ investm. (years)									
< median (1.0)	-0.4	26.8	296	12.2***	24.9	163	-18.6***	18.4	115
> median (1.0)	3.0***	27.2	885	14.0***	27.6	484	-12.1***	18.8	315
Fund age @ exit (years)									
< median (6.0)	2.9***	27.8	625	15.2***	27.4	351	-15.7***	17.6	221
> median (6.0)	1.6	26.4	576	11.6***	26.3	308	-11.7***	20.0	215
Fund sequence									
< median (2.0)	2.5*	27.4	468	13.6***	29.2	262	-13.1***	16.9	161
> median (2.0)	2.3**	27.2	734	13.6***	25.9	399	-14.1***	20.0	273
Fund Target Size (USD mn)									
< median (400)	2.2	26.7	220	11.3***	26.4	136	-12.8***	16.9	68
> median (400)	2.9**	25.2	317	12.1***	22.5	184	-15.0***	19.3	101

Table 7: Overall market timing grouped by good and bad investment and exit timing
The 2x2-matrix of Table 7 shows the delta between investment and exit market multiples that PE funds achieve. Here, we split PE funds into four categories: funds that (i) time the markets at investment (market multiples at investment lower than average multiples in investment period) and exit (market multiples at exit higher than average multiples in exit period), (ii) time the markets at investment but not at exit, (iii) do not time the markets at investment but at exit, and (iv) time the markets neither at investment nor at exit. We also show the number of deals in each of the four categories. The difference of the means from zero is verified through t-tests. Investment and exit timing figures are winsorized at the 1% level.

Market timing	**Winners - good exit timing**	**Losers - bad exit timing**
Winners - good investment timing	5.4***	0.9***
(#)	(353)	(374)
Losers - bad investment timing	0.0	-4.5***
(#)	(256)	(319)

Figure 2: Contribution of market timing to total net IRRs

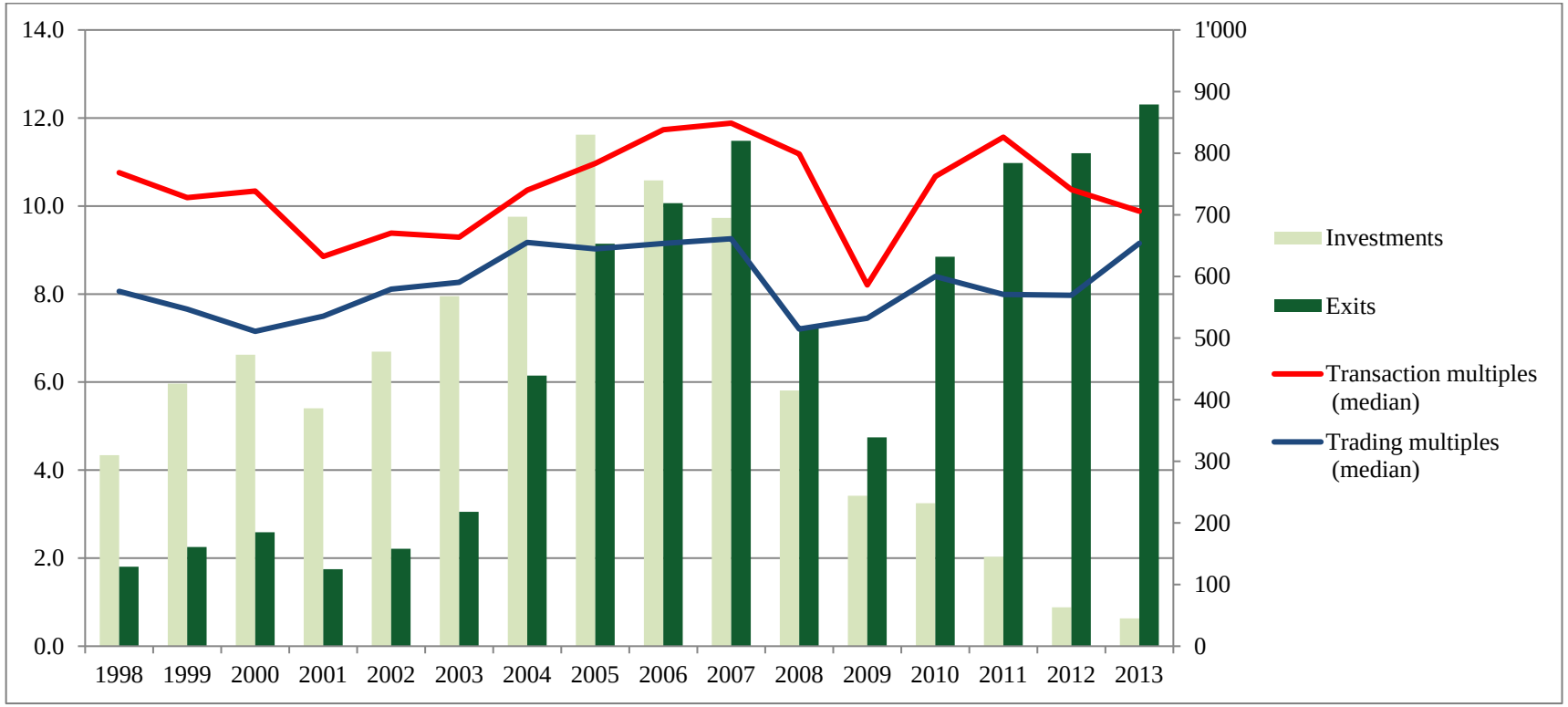
Figure 2 shows the contribution of market timing to the overall value creation (measured by net IRRs) according to our estimations. For this we compute our own market timing IRR by dividing market multiples at exit by market multiples at investment and by putting this in relation to the portfolio company holding period (((Exit market multiple/investment market multiple)^(1/holding period))–1). Total net IRRs are fund IRRs (net of fees) which we collect from our Preqin fund database. The years on the x-axis are fund vintage years.



Appendix

Appendix 1: Transaction and trading multiple development 1998-2013

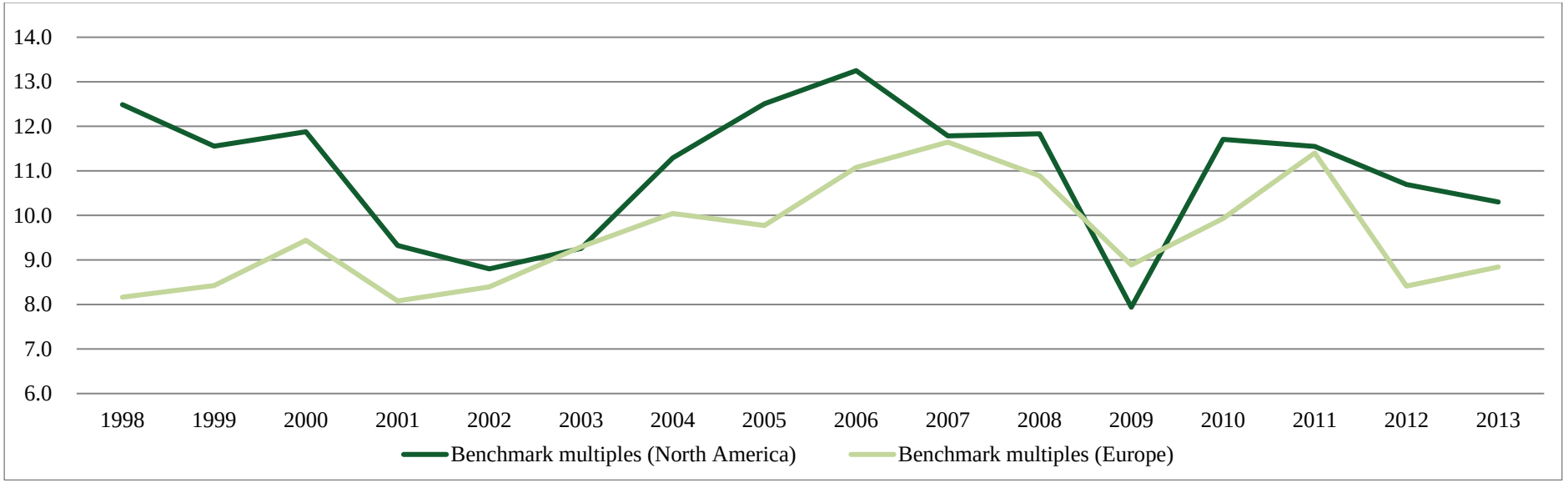
Appendix 1 shows the median transaction (red line) and trading (blue line) multiples from 1998 to 2013. Transaction multiples are made up of the targets' enterprise value (EV) over the targets' EBITDA while trading multiples are made up of a listed company's market capitalization plus net debt over EBITDA. The difference between the two is the premium that acquirers pay in their transactions. The dark green bars represent the number of investments that PE funds completed in the respective year. The light green bars represent the number of exits that PE funds completed in the respective year.



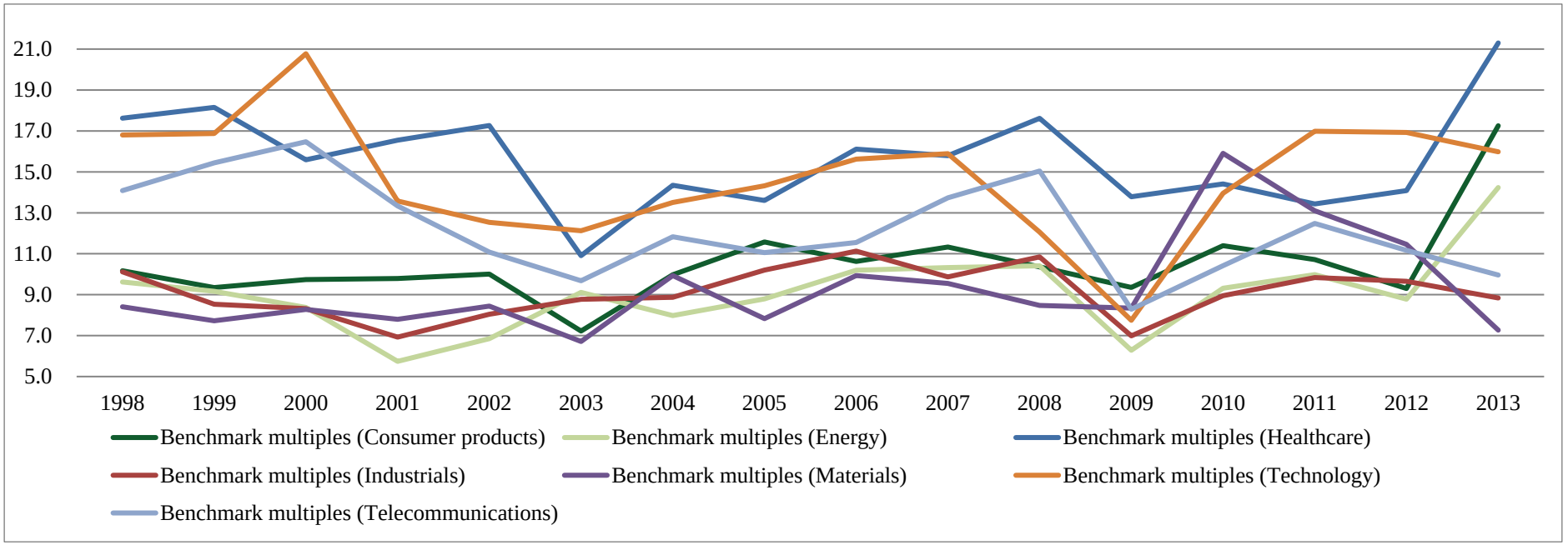
Appendix 2: PE transaction market multiples in 1998-2013 – by regions and industries

Appendix 2 shows the median transaction multiples from 1998 to 2013. Appendix 2A splits the median transaction multiples by region (North America and Europe) while Appendix 2B splits them by industry (consumer products, energy, healthcare, industrials, materials, technology, telecommunications).

Appendix 2A:



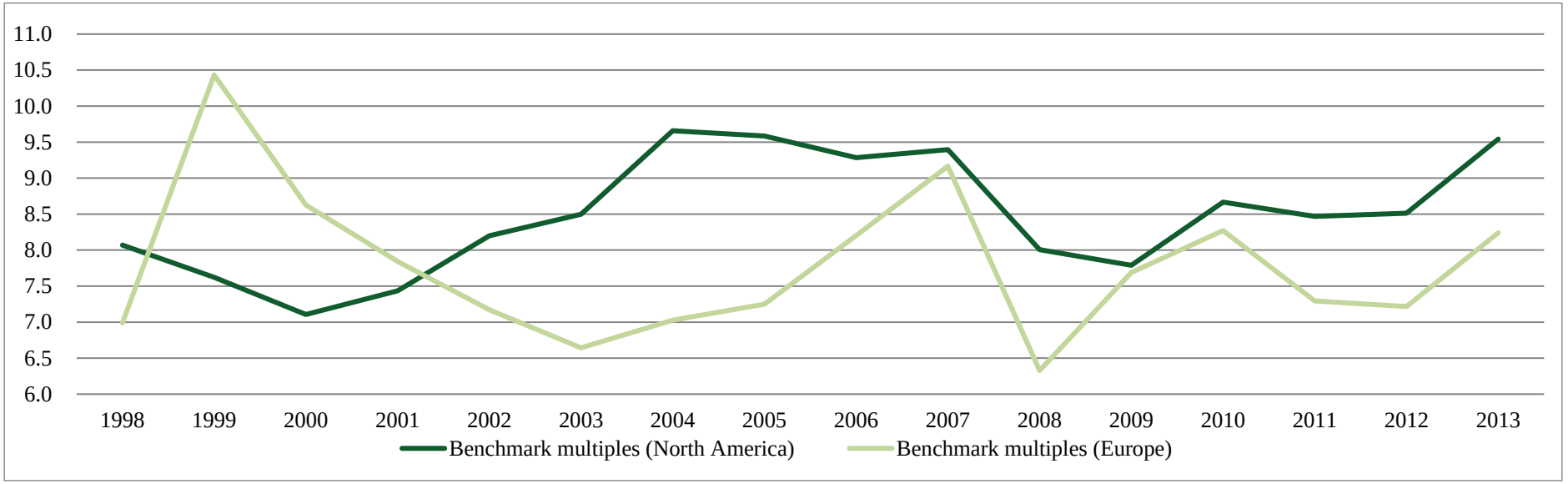
Appendix 2B:


21.0
19.0
17.0
15.0
13.0
11.0
9.0
7.0
5.0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Benchmark multiples (Consumer products)
Benchmark multiples (Energy)
Benchmark multiples (Healthcare)
Benchmark multiples (Industrials)
Benchmark multiples (Materials)
Benchmark multiples (Technology)
Benchmark multiples (Telecommunications)

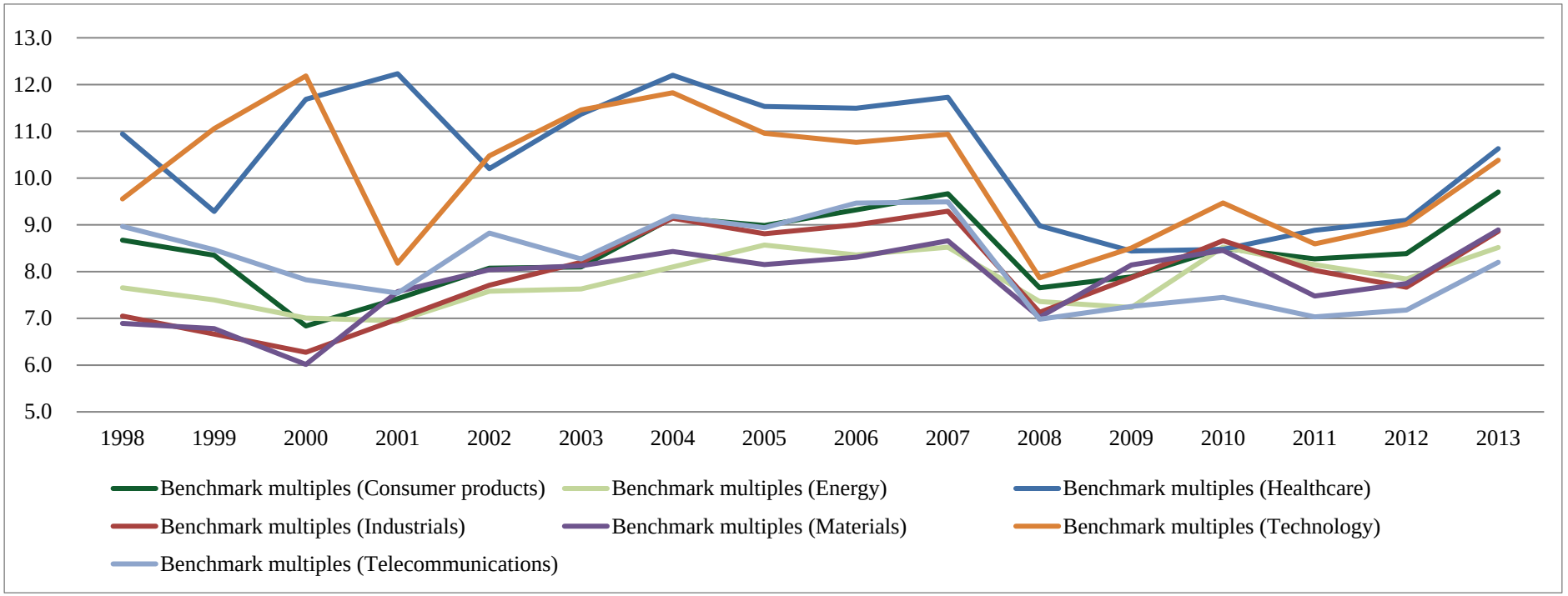
Appendix 3: PE trading market multiples in 1998-2013 – by regions and industries

Appendix 3 is identical to Appendix 2 but it shows the median *trading* multiples (instead of transaction multiples) from 1998 to 2013. Appendix 3A splits the median transaction multiples by region (North America and Europe) while Appendix 3B splits them by industry (consumer products, energy, healthcare, industrials, materials, technology, tele-communications).

Appendix 3A:



Appendix 3B:


13.0
12.0
11.0
10.0
9.0
8.0
7.0
6.0
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1998
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2002
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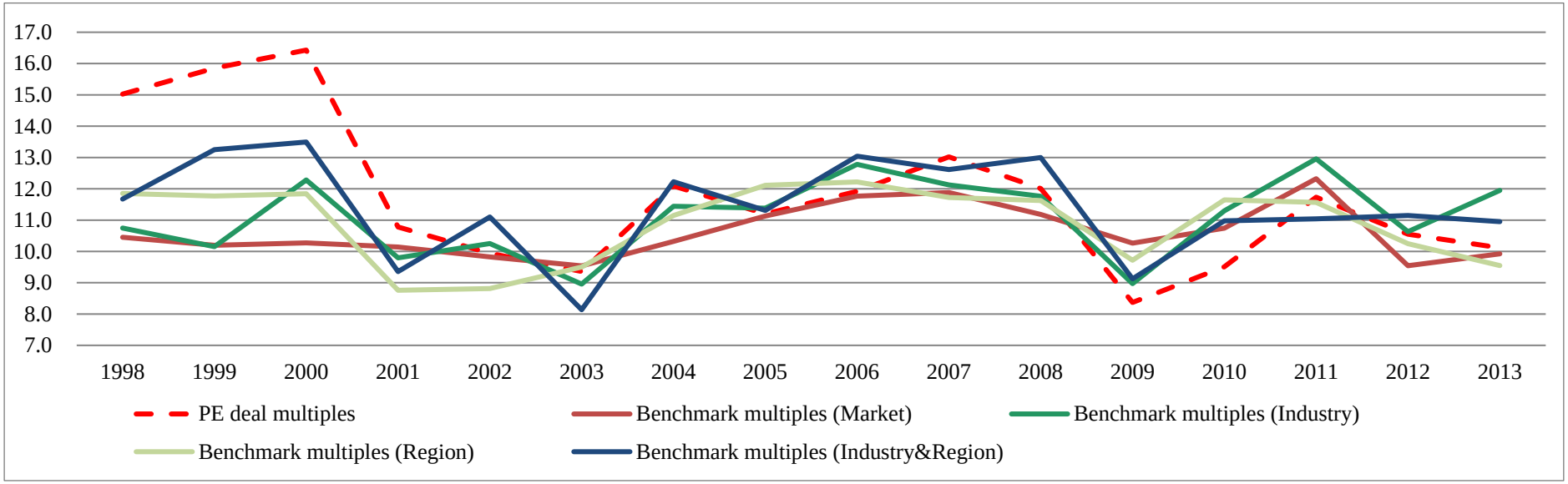
2007
2008
2009
2010
2011
2012
2013
Benchmark multiples (Consumer products)
Benchmark multiples (Energy)
Benchmark multiples (Healthcare)
Benchmark multiples (Industrials)
Benchmark multiples (Materials)
Benchmark multiples (Technology)
Benchmark multiples (Telecommunications)

Appendix 4: PE exit multiples and market multiples in 1998-2013

Appendix 4 shows a set of median EV/EBITDA multiples from 1998 to 2013. The graph underlines the high correlation of PE deals and market multiples as this is the major underlying assumption of this paper. The dotted red line represents the median multiples of approximately 1,600 PE exit deals that are also used by Morkoetter and Wetzer (2016). These PE deals are from Thomson One and are otherwise not used in our analysis. The dark red line represents median multiples (benchmarked by investment time; the correlation with PE transaction multiples is 0.2), the light green line represents median multiples (benchmarked by investment and target region; the correlation with PE transaction multiples is 0.5), the dark green line represents median multiples (benchmarked by investment time and target industry; the correlation with PE transaction multiples is 0.4), and the blue line represents median multiples by (benchmarked by investment time, target industry, and target region; the correlation with PE transaction multiples is 0.8).



Appendix 5: Impact of investment/exit timing on overall market timing

Appendix 5 presents the results of pooled ordinary least squares (OLS) regressions on the market timing (the delta between market multiples at investment and market multiples at exit). Independent variables are investment and exit timing variables. We split our deals into four exit types in regressions (2) to (5). Numbers in the upper rows represent the regression coefficients; numbers in brackets in the lower row represent the respective standard errors. *, **, and *** indicate p-values at the 10%, 5%, and 1% significance level, respectively. Numbers are winsorized at the 1% level.

	Dependent variable: market timing				
	All exit types	**IPOs**	**Trade sales**	**Secondaries**	**Other**
Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Investment market timing	**-0.104*** **	**-0.097*** **	**-0.115*** **	**-0.091*** **	**-0.094*** **
	(0.003)	**(0.009)**	**(0.004)**	**(0.004)**	**(0.008)**
Exit market timing	**0.108*** **	**0.088*** **	**0.114*** **	**0.099*** **	**0.110*** **
	(0.003)	**(0.011)**	**(0.005)**	**(0.005)**	**(0.013)**
Constant	0.378***	0.263	0.402***	0.435***	0.369***
	(0.048)	(0.189)	(0.091)	(0.061)	(0.117)
Observations	1,395	137	614	445	199
R-squared	0.810	0.776	0.819	0.854	0.789
Standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					