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Pursuit of Excess Returns: Deciphering Performance in European Buyout Funds

A Detailed Exploration of Relative Returns and Their Determinants

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Abstract

This paper investigates the relative performance of European buyout funds compared to public markets. Using a sample of mature buyout funds, obtained from European limited partners, with vintages between 1995 and 2013, we find that a European buyout fund, on average, outperforms the STOXX Europe 600 index by 52% over its lifetime. While our findings display considerable robustness to various assumptions regarding the opportunity cost of capital, systematic risk, and unrealized portfolio values, they also highlight an interesting sensitivity to inter-year variations in relative returns.

Our study contributes to the ongoing debate about the performance of private equity funds, and the potential determinants of performance, such as fund size, prespecified target industry, and experience of fund managers. We find evidence for a narrower investment focus and sector-specific effects positively influencing performance, findings valuable to investors, academia, and stakeholders alike.

JEL Classification: G10, G11, G23

Key Abbreviations / Lexicon

PE — Private Equity
VC — Venture Capital
LP — Limited Partner
GP — General Partner
EBF — European Buyout Fund
PME — Kaplan Schoar Public Market Equivalent
IRR — Internal Rate of Return

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1 Introduction

Private Equity (PE) is an asset class shrouded by secrecy due to the scarce disclosure requirements for the industry combined with high capital commitment requirements and long waiting lists for PE funds' investors, known as Limited Partners (LPs). This industry has, since its emergence in 1979 with the creation of KKR, transformed from initially being seen as "Barbarians at the gate" to a value-generating industry.[1] Today, PE significantly impacts global financial markets and is a crucial driver in developing entrepreneurs and companies through active ownership. The importance of the asset class is further exhibited by the record fundraising amount of 170 billion Euros achieved by the European PE industry in 2022 (InvestEurope, 2023). While PE has long been a staple in institutional investors' portfolios, it has recently become more publicly available through various investment vehicles.[2] This democratization of the asset class led to increased public interest and accessibility, although investing in PE remains primarily reserved for a select group of investors.

The significance of PE as an asset class has resulted in a vast literary landscape with various research areas. One of the most prominent research areas has been the performance of PE funds in relation to public equities, which is characterized by inconclusive evidence and mixed results. The research on PE performance is of considerable academic importance, given the ensuing significant implications for the investment decisions of institutional investors. In addition to the mixed results and the implications of excess returns, the European PE market remains relatively less studied than the American market, despite being the second largest (Sharma et al., 2023). Most prominent previous research has predominantly focused on U.S. PE funds due to the U.S. being the largest and most developed market. Furthermore, European public equities have aggregately exhibited lesser returns than U.S. equities during the last decades. This reinforces the need to further investigate the relative returns of the European PE industry.

Building upon the methodology by Kaplan and Schoar (2005), this thesis aims to answer whether European buyout funds (EBFs) exhibit excess returns compared

[1] Barbarians at the gate is a phrasing often used to describe the early stages of private equity. The phrase stems from Ted Forstmann, partner at Forstmann Little & Co, when KKR acquired RJR Nabisco in 1989.

[2] A typical investment vehicle is a fund-of-funds which is a fund that commits capital to several PE funds and have lower entry barriers for investors compared to investing directly into the funds.

to the public markets. We will conduct a thorough analysis using a comparative approach that includes both absolute performance measurements, and the Kaplan-Schoar Public Market Equivalent (KS-PME), a prominent measure of relative performance. The KS-PME, henceforth denoted as simply PME, and its different adaptations were developed to accurately depict the opportunity cost of capital for investors investing in PE by accurately accounting for the timing and the net of fees size of cash flows. Thus, the framework overcomes the potentially misrepresentative assumptions and subjectivity in returns in the Internal Rate of Return (IRR), the industry's primary performance measurement. Additionally, this thesis investigates performance determinants in order to gain insights into the factors influencing the dynamics of PE performance. The thesis will investigate the impact of fund size, experience, and target industry on fund performance. These factors are hypothesized to significantly impact performance based on economic relationships and the results of previous academic research. Furthermore, this thesis solely focuses on the European PE market as it has received relatively less attention from previous research than the U.S. market. We also limit ourselves to studying buyout funds, the largest and most prominent fund type within the PE market.

This thesis, therefore, aims to contribute to the existing empirical literature on PE performance in multiple ways. First, this thesis employs a proprietary dataset that enables the usage of the PME methodology to provide a comprehensive analysis of PE performance in conjunction with absolute performance measurements. Second, this thesis supplements earlier research conducted on EBFs by employing performance determinants previously shown to significantly affect returns on a proprietary dataset, including recent fund returns. Third, this thesis expands on earlier research by including alternative performance determinant definitions that have not been extensively studied or have been studied in alternative specifications with inconclusive results.

We structure the remainder of this paper as follows: Section 2 presents an introduction to the PE asset class in general and the buyout sector in specific. Section 3 reviews previous literature relevant to the purpose and methodology of this paper. Section 4 introduces the methodology for testing absolute and relative returns. Section 5 details the data collection process and presents descriptive statistics. Section 6 delivers the results, analysis, and limitations of the study. Finally, we present our conclusions in Section 7.

2 Private Equity

2.1 Private Equity Funds

PE is a broad term that describes investments in private companies or the acquisition of publicly traded companies to take them private. The sector is divided into four main categories of investor types, each with its own investment focus. The first category is venture capital (VC), which invests in early-stage companies with high risk and return potential. The second category is growth equity, which acquires minority shares in companies experiencing rapid growth. The third category is buyout, which focuses on acquiring majority shares in mature companies, often through extensive leverage. The final category is alternative strategies, which involve investments in distressed companies and tangible assets, such as real estate and infrastructure (Zeisberger et al., 2017).

A PE fund is often organized as a "closed-end" fund, meaning that the investors cannot withdraw their committed capital before the fund has been terminated, thus making investments in PE funds highly illiquid.[3] The fund is legally structured as a limited partnership where the LPs invest the majority of the money, and the General Partners (GPs) manage the fund. The LPs mainly include institutional investors such as public pension funds, endowments, insurance companies, and sovereign wealth funds (Metrick & Yasuda, 2010; Kaplan & Strömberg, 2009). The fund's GP is the PE firm that created the fund. The GP often manages several funds simultaneously, as it is common for the GP to attempt to raise a new fund once a large share of the committed capital in the current fund has been invested (Loos & Schwetzler, 2017).

PE funds generally have a finite lifespan of ten years. The lifespan can typically be extended by up to three years to achieve the optimal exit circumstances for the portfolio companies. The fund's lifespan is divided into two periods, the first being the investment period, generally the first five years of the fund. During this period, the GP deploys the committed capital to acquire target companies. The committed capital is called upon from the LPs only when it can be deployed, meaning that the LPs do not transfer the entirety of their committed capital to the fund at one point in time. Typically, the LPs only have a short time to contribute capital once it is called upon, forcing LPs to hold significant amounts

[3]Committed capital refers to the amount of money that the limited partners have agreed to invest in the fund.

of liquid assets to cover capital calls. The second period is the divestment period, where the fund usually has five to eight years to exit the investments and return the capital to the investors. When the fund exits an investment, the capital is returned to the LPs and is not reinvested, known as a capital distribution. Once the LPs have committed their capital to the fund, they have limited influence over the deployment of the funds capital, given that the GP follows the fund covenants. Typical fund covenants are restrictions on the amount of capital invested into a single portfolio company, the amount of capital the fund can invest in equity and debt instruments, and the amount of debt the fund can take on (Kaplan & Strömberg, 2009).

The fund's GP is compensated through variable and fixed components stipulated in the partnership agreement signed at the fund's inception. While the compensation from fixed components shares characteristics with mutual- and hedge funds, the variable components are specifically constructed based on the characteristics of PE (Metrick & Yasuda, 2010). The GPs are first compensated through an annual management fee, commonly constructed as a percentage of the committed capital. When the portfolio companies are divested, the fee becomes a percentage of capital employed. Secondly, the fund's capital gains are distributed amongst the LPs and GPs. This distribution is known as a "distribution waterfall" due to the characteristics of the distribution. First, the LPs receive their invested capital, followed by a preferred return known as a hurdle rate. This hurdle rate varies between funds and should reflect the current market climate. Once the LPs have received their preferred returns, the GPs receive a compensation known as a catch-up, generally equal to 20% of the distributed capital to the LPs. Once these distributions have been made, the GPs receive a variable compensation known as "carried interest," a predetermined percentage of the remaining capital gains, generally 20%. Lastly, GPs may charge portfolio companies and investors deal and monitoring fees which can be either fixed or variable (Kaplan & Strömberg, 2009).

2.2 Buyout Funds

Buyout funds seek to find target companies where they can acquire a majority equity stake which allows the fund to decide on strategic actions to achieve the desired value creation. The funds aim to create value in their portfolio companies by reforming governance, operational and financial characteristics through

working with stakeholders such as the management team, financial institutions, and the board of directors. The buyout strategy combines three central pillars: equity control, economic alignment, and leverage (Zeisberger et al., 2017).

A buyout fund typically aims to have equity control by acquiring a majority of the voting rights in the target company, thus allowing the fund to implement necessary changes for the value-creation process. Examples of such reforms are introducing more leverage to the company, setting up processes for operational improvements, and altering the management team. Equity control is also essential for structuring the exit, as the fund must have control over organizational and strategic decisions to position the portfolio company for sale.

The economic alignment of interest between the portfolio company's management team and the fund is essential for the value-creation process. Commonly, interests align through management compensation plans, which gives key executives equity stakes with a significant potential upside. By incentivizing the management team through equity, the fund obtains an alignment of interest as the portfolio company's operations will be governed to achieve maximal equity value. However, the management's equity incentives pose a risk in case of a non-successful development, as their equity is subordinate to the fund.

Leverage is a vital driver of the buyout strategy, as most transactions are made as leveraged buyouts (LBOs). Once a buyout has been made, the new portfolio company will commonly have a debt-to-equity ratio of around 50-75%. The amount of leverage used in a buyout depends on several factors, such as the company's cash flow generation, market climate, the GP's reputation and history, and consistency of cash flow generation in the industry. The primary cause of using leverage in buyouts is the ability to obtain greater returns on the investment. Having leverage increases the expected return on capital employed for the fund by reducing the equity needed to conduct the acquisition.

3 Theory and Hypothesis Development

This chapter provides a theoretical context for the relative performance of EBFs (Section 3.1) and possible performance determinants (Section 3.2). Additionally, Section 3.1 discusses the commonly used robustness tests which are used to ensure rigidity in the results. Section 3.1 and each section in 3.2 conclude with a formalized hypothesis, bridging theory, and prior academic work with the research presented in this paper.

3.1 Relative Performance of Private Equity

During the last two decades, research on PE performance has grown substantially due to the creation of higher-quality datasets. This research has portfolio and portfolio company-centric approaches to measuring performance in either absolute or relative terms. The relative performance of PE funds compared to public equities is extensively studied, although without any definite conclusions, as the illiquid nature of PE should grant the LPs a liquidity premium (Ang et al., 2014). One of the most prominently cited papers researching PE performance comes from Harris et al. (2014). The study uses the PME framework and concludes that US buyout funds persistently outperform the S&P 500 index by, on average, 20% to 27% over a fund's lifetime. The authors further highlight the "commitment risk" as a factor that should yield LPs a premium on their returns.[4]

Contrary to these findings, Phalippou and Gottschalg (2009) and later Phalippou (2014) find that the relative returns of U.S. and EBFs, measured by the PME, are heavily affected by the choice of the benchmark index. Both papers find that PE funds underperform their benchmark index when accounting for portfolio- and portfolio company characteristics such as leverage and target company size. However, the results may understate the relative performance as Stucke (2011) identifies that the dataset contains non-updated fund performance. This entails that cash flows and the value of the unrealized investments, commonly known as the Net Asset Value (NAV), remain unchanged and return multiples are left constant over time.

L´Her et al. (2016) differ from the aforementioned studies by constructing an appropriate benchmark index based on risk adjustments to bridge the contrary

[4]Commitment risk refers to the uncertain timing of capital calls which imposes that LPs must maintain liquid assets to cover their commitments.

findings of Harris et al. (2014) and Phalippou (2014). The main finding is that the funds outperform the S&P 500 and the risk-adjusted benchmark when using the PME as the performance measurement. However, when employing a value-weighted PME, there is no evidence that the funds outperform either benchmark index. There is inconclusive evidence on which version of the PME is the most appropriate, as a subjective assessment is necessary for deciding the appropriate weighting. Likewise to the findings of L´Her et al. (2016), Ilmanen et al. (2020) conclude that the performance of the PE industry is in a diminishing trend over time, thus suggesting that expected future performance is not as attractive compared to public markets as it has historically been.

Based on the recent literature finding subpar relative returns for PE, Brown and Kaplan (2019) authored the article "Have Private Equity Returns Really Declined?" to provide their perspective on performance. Using the same dataset as L´Her et al. (2016), the study finds an average PME of 1.22 from 1984 to 2014, meaning that the observed sample has significantly outperformed the S&P 500. The authors also state that the immaturity of recent fund vintages could explain the different results obtained by L´Her et al. (2016). The authors ultimately find that the excess performance is in a declining trend. However, the excess return remains positive and robust to multiple benchmark indexes.

Although previous research has produced conflicting results, there are two main reasons to expect that EBFs should have a return premium compared to public markets. The first reason is the illiquidity premium compensating the LPs for the lack of liquidity. Additionally, LPs face a commitment risk as they are obliged to commit capital at uncertain times. To determine whether EBFs generate excess returns, we employ a set of relative and absolute performance measurements to give a nuanced understanding of the performance. Based on the literary framework and underlying theoretical concepts, we expect to find outperformance for EBFs. This paper defines the first hypothesis as follows:

H_1: *EBFs generates excess relative performance compared to public markets*

3.1.1 Sensitivity to Benchmark

The benchmark is a vital component of the PME calculation and could significantly affect the results. The most common benchmark is the S&P 500, a value-weighted index representative of the U.S. economy. However, the S&P 500 might not represent the PE industry as the constituents differ in characteristics such

as leverage and size from the typical PE portfolio company (Brown & Kaplan, 2019). Several attempts have been made to find the appropriate benchmark. Sorensen and Jagannathan (2015) argue that the S&P 500 is a suitable benchmark if investors have log utility, while other works of literature argue for alternative benchmarks (Phalippou & Gottschalg, 2009; Phallipou 2014). Robinson and Sensoy (2016) create a "tailored PME" where the PME calculation depends on choosing a benchmark index reflective of the fund characteristics.

L'Her et al. (2016) use the S&P 600 to observe the sensitivity of relative performance. The S&P 600 is designed to reflect the U.S. economy of small-sized companies. The authors argue that the average buyout target company is more similar in characteristics to the constituents of the S&P 600, which renders this index to reflect a more accurate discount rate. The study concludes that excess relative performance is robust to the choice of benchmark, although marginally lower for the S&P 600 benchmark. Phalippou (2014) employs a more extensive framework to determine benchmark sensitivity by calculating multiple PMEs using different indexes accounting for company size and characteristics. The paper shows that the average buyout target company is similar to a small-cap value company and PE funds generally underperform small-cap and small-cap value indexes. Based on the subjective nature of choosing an appropriate benchmark index, we test the robustness of the relative performance on multiple benchmark indexes – further explained in Section 6.2.4.

3.1.2 Sensitivity to NAV

There are two primary approaches to PME calculation regarding NAV treatment. The prevalent method involves treating NAV as a cash distribution at the sample period's end date, effectively liquidating the funds (Harris et al., 2014; L´Her et al., 2016; Robinson & Sensoy, 2016). This assumption requires NAV to be an unbiased estimate of the remaining assets' true market value. The alternative is to write off any remaining NAV, which may be justifiable for mature funds or when there is suspected bias in NAVs (Phalippou & Gottschalg, 2009; Phalippou, 2014).

The primary concern is thus whether the NAVs are unbiased and reflect the actual value of the fund. Third-party consultants and auditors typically determine NAVs, nonetheless, the valuation process remains subjective (Kaserer & Diller, 2004). Jenkinson et al. (2013) and Brown et al. (2019) find that NAV valuations

are generally conservative, with Jenkinson et al. (2013) reporting the average NAV to be underreported by 35% compared to later distributions. However, during fundraising periods, NAVs may be overstated, a phenomenon more common in poor-performing funds. Additionally, GPs that overstate the NAVs are less likely to succeed in raising a subsequent fund, indicating that LPs possess the capability of detecting GP manipulation. Conversely, Phalippou and Gottschalg (2009) and L´Her et al. (2016) express a more skeptical view of the accuracy of NAVs. The two papers argue that NAVs, especially for funds of older vintages, are likely to be overstated and should be treated cautiously. Based on the inconclusive evidence of how accurately GPs calculate NAV, we test the robustness of relative performance by excluding NAV – further explained in Section 6.2.5.

3.1.3 Sensitivity to Systematic Risk

A central question when applying the PME methodology is whether the market adjustment inherent in the benchmark index sufficiently risk-adjusts the funds' returns. Sorensen and Jagannathan (2015) examine whether the PME, which does not consider the beta representing the systematic risk, provides a valid risk-adjusted economic performance measure. The authors find that the PME is a valid measurement regardless of systematic risk when the investors have log-utility preferences. However, assuming all investors have log utility might not be feasible, and the systematic risk should therefore be controlled for (Kaplan & Sensoy, 2015).

In attempts to determine the systematic risk, several studies estimate the betas of PE funds based on portfolios of public equities. Driessen et al. (2012) estimate the betas for U.S. and European PE funds and conclude with buyout funds exhibiting a beta of 1.31. Ang et al. (2018) introduce alternative factor models in the estimation process. The study contains U.S. funds and observes a market beta of 1.18 for buyout funds.

In conjunction with the findings of non-unitary betas, several studies have been conducted to determine PME sensitivity to systematic risk. Harris et al. (2014) simulate betas of 1.5 and 2 by leveraging the benchmark index used to calculate the PME. The PMEs are found to be insensitive to different betas and the authors conclude that systematic risk does not explain the PME. Phalippou (2014) employs the same methodology and calculates a beta for his sample of 1.3. The PMEs using large-cap indexes display only a minor divergence from the

unlevered benchmarks, while a large divergence is found for small-cap indexes. Finally, the paper presents evidence for a convex relationship between PME and beta as previously found by Robinson and Sensoy (2016). Based on the literature above, this study tests the robustness of relative performance to systematic risk by using different betas suggested by previous research – further explained in Section 6.2.6.

3.2 Performance Determinants

3.2.1 Fund Size

The fee structure of PE funds generally incentivizes GPs to increase fund size for higher carried interest. However, LPs might also find larger funds more attractive since they usually enjoy greater deal sourcing resources and the ability to pursue larger investment opportunities. One of the most influential papers in this field is authored by Kaplan and Schoar (2005). Their research reveals a positive, although concave, relationship between EBF size and performance, indicating diminishing returns beyond a certain size threshold. This may result from larger funds having a more restricted investment universe, as they must deploy more capital per investment. While Kaplan and Schoar (2005) identify a concave relationship between fund size and performance, other studies note an increase in relative performance with fund size, but find no evidence of a similar concave trend (Phalippou & Gottschalg, 2009; Higson & Stucke, 2012). To expand on these findings, Harris et al. (2014) study a large dataset containing U.S. buyout and VC funds. Contrary to prior results, the authors do not find a strong correlation between fund size and performance, results shared with Ljungqvist and Richardson (2003). The only noticeable finding is that the smallest quartile of funds tends to have lower performance for both fund types, suggesting the existence of size-related effects on performance. Based on the literary framework above, we expect to find that larger funds exhibit greater returns due to economies of scale. This paper defines the second hypothesis as follows:

H_2: *Fund size has a positive impact on performance*

3.2.2 GP Experience

In the realm of PE, GP experience is crucial since LPs invest based on limited information about future transactions without control over investment decisions. Consequently, the performance of previous funds plays a vital role in assessing

GP experience. Diller and Kaserer (2009) associate experience with whether a GP's previous fund's IRR exceeds the median IRR for that vintage year and find a positive correlation between the current and previous fund's returns, indicating return persistence. Kaplan and Schoar (2005) present a different approach for measuring GP experience, considering the sequence number of a fund and whether it is a first-time fund as proxy measures. The study demonstrates that a GP with high past performance is more likely to raise additional funds, indicating that experienced GPs generally manage non-first-time funds. Furthermore, the authors find a positive correlation between fund sequence number and PME, while first-time funds correlate negatively. Multiple hypotheses exist to explain the underperformance of first-time funds. One plausible explanation may relate to investment behavior. Ljungqvist et al. (2020) find that GPs of first-time funds might be more inclined to invest in riskier targets to generate higher returns, potentially leading to underperformance. Based on the literary framework above, we expect to find that experienced GPs exhibit greater performance due to the active involvement of the GPs in the portfolio companies. This paper defines the third hypothesis as follows:

H_3: *GP experience has a positive impact on performance*

3.2.3 Target Industry

Gohil and Vyas (2016) complement return-based research on GP experience by measuring its effect through skill factors, such as investment size, industry focus, and exit route. The study uses several performance measurements and finds varying results, which altogether indicate that skill factors impact performance. Having a specified target industry implies that the GP is considered experienced within that sector and should therefore obtain excess returns. Burth and Reißig-Thust (2019) reaffirm these findings when they study the performance of companies acquired by German PE funds. GPs investing in asset-light industries and healthcare were found to be positively correlated with performance, a further testament to the GP experience's effect. Based on the literary framework above, we expect to find funds with defined target industries to exhibit greater performance due to dedicated target industry expertise. This paper defines the fourth hypothesis as follows:

H_4: *A focused target industry has a positive impact on performance*

4 Methodology

To answer the first hypothesis, whether EBFs generate superior returns compared to public markets, this thesis utilizes absolute and relative performance metrics independently and comparatively. The industry-standard absolute performance measures include the IRR, the Distributed to Paid-In multiple (DPI), and the Total Value to Paid-In multiple (TVPI). Including absolute performance measures complements the analysis of relative performance and provides a more comprehensive understanding of PE's overall return and risk profile. To calculate the relative return, this study utilizes the PME framework.

The performance metrics are analyzed from an aggregated perspective and a time-series perspective to enable conclusions regarding the robustness of performance and time-fixed effects. Additionally, to gain more significant insights into fund performance dispersion, the funds are divided into quartiles based on their performance for each of the three studied decades. This enables conclusions to be drawn regarding the distribution of excess performance, which is crucial for determining systematic outperformance. Furthermore, to ascertain the robustness of the results, this thesis conducts sensitivity analyses concerning the benchmark index, NAV, and systematic risk.

The remainder of this section discusses and defines the industry-standard absolute performance measurements (Section 4.1) and the PME framework, including sensitivity variations (Section 4.2). To answer the remaining hypotheses, this thesis conducts multiple cross-sectional regressions to answer whether fund size, GP experience, and target industry explain differences in relative returns. The regression specifications and results are presented in Section 5.3.

4.1 Industry-Standard Performance Measurements

4.1.1 IRR

This study employs the IRR of fund-level cash flows as the first absolute performance measurement, as it remains the PE industry's preferred measure (Zeisberger et al., 2017). The IRR represents the discount rate which makes the net present value (NPV) of the cash flows to the LP equal to zero. The IRR is derived from the following equation:

$$0 = NPV = CF_0 + \sum_{t=1}^{T} \frac{CF_t}{(1 + IRR)^t} \tag{1}$$

where,
CF_0 = Initial investment
CF_t = Net cash flow during period t
T = Total number of periods

It is important to mention that IRR is a criticized measurement for its weaknesses. First, the IRR is subject to the endogenous timing of the funds' calls and distributions, resulting in a potentially contaminated return. This timing is primarily driven by the reinvestment assumption of the IRR calculation, which assumes that distributed capital to LPs is reinvested at the same IRR as the exited investment. Therefore, PE funds are generally eager to exit their successful investments early to inflate the IRR, resulting in a contaminated measurement (Phalippou, 2011; Sorensen & Jagannathan, 2015; Zeisberger et al., 2017; Larocqueet al., 2022). Second, IRR is an absolute return measurement, which differs in calculation from the total return measurement commonly used for public equities, thus limiting comparisons to be made. However, despite the problematic nature of the IRR measurement, it will serve as an absolute return proxy in our comparative analysis.

4.1.2 DPI and TVPI

The second absolute return approach comprises the industry standard DPI and TVPI multiples. Multiples are often preferred over IRR as performance measures as they are solely based on LPs' cash flows and thus accurately depict the returns received when investing in a PE fund. The DPI considers only the realized distributions to the LP, while the TVPI also incorporates the unrealized distributions (NAV). Despite the subjectivity of NAV, this paper mainly focuses on the TVPI multiple, as the inclusion of the NAV introduces less bias than removing it altogether. The DPI and TVPI are defined in accordance with Phalippou and Gottschalg (2009) and Zeisberger et al. (2017):

$$DPI = \frac{\sum dist}{\sum cont} \tag{2}$$

$$TVPI = \frac{\sum dist + NAV}{\sum cont} \tag{3}$$

where,
$\sum dist$ = The sum of the distributions to from the fund
$\sum cont$ = The sum of all contributions to the fund
NAV = The residual value of the fund

4.2 PME Methods

4.2.1 PME

This thesis utilizes the PME as the primary measurement of relative returns due to its simplicity in interpretation and accuracy in measuring excess performance. The measurement was developed by Kaplan and Schoar (2005) to overcome the drawbacks of earlier relative return measurements such as the Index Comparison Method. The PME calculates the relative return of a PE fund compared to a chosen benchmark index by discounting the capital calls and distributions by the index's return. The PME can intuitively be interpreted as shorting a public equity index to pay contributions to the fund and using distributions to close the short positions (Robinson & Sensoy, 2016). The PME is an easily interpretable measure of relative return that can be viewed directly as a market-adjusted multiple on committed capital, net of fees (Harris et al., 2014). For example, if the PME is equal to 1.2, the PE fund has outperformed the public market by 20% over the fund's lifetime. The PME is defined by the following equation:

$$PME = \frac{FV(D) + NAV_T}{FV(C)} \tag{4}$$

where,
$\sum_{t=1}^{T}(dist_t \times \frac{I_T}{T_t})$ = Future value of distributions $[FV(D)]$
$\sum_{t=1}^{T}(cont_t \times \frac{I_T}{T_t})$ = Future value of contributions $[FV(C)]$
$dist_t$ = Distribution from the fund to the LP at time t
$cont_t$ = Contribution to the fund from the LP at time t
I_t = Benchmark index quote at time t

4.2.2 Tailored PME

The tailored PME follows the same calculations as the PME, although it enables alternations between benchmark indexes to account for non-market factors in public market returns (Robinson & Sensoy, 2016). The fundamental assumption of the relative return in PME is to compare benchmarks with similar features to the PE fund. Consequently, the relative return constitutes the difference in returns between the fund and the alternative investment opportunities presented to the LP.

4.2.3 NAV-Redacted PME

The NAV-Redacted PME follows a similar specification to the PME, with the exception of NAV not being included as a final cash distribution. This measurement serves as a tool in comparative analysis in response to the previous discussion of the reliability of NAV. For mature funds, this PME version should be very close to the actual PME. The NAV-Redacted PME is derived in accordance with Phalippou (2014):

$$NAV - Redacted\ PME = \frac{FV(D)}{FV(C)} \tag{5}$$

4.2.4 Levered PME

The Levered PME enables the PME, which does not explicitly account for systematic risk, to account for market risk by leveraging the benchmark index to simulate different beta values of the funds (Robinson & Sensoy, 2016). Furthermore, the calculation for the levered PME displays the close connection between PME and the TVPI. Assuming a beta of 1 means that the levered PME is equal to the PME, and assuming a beta of 0 means that the levered PME is equal to the TVPI. The Levered PME is derived using the following method:

$$Levered\ PME(\beta) = \frac{FV(D) + NAV}{FV(C)} \tag{6}$$

where,
$\sum_{t=1}^{T}(dist_t \times \beta\frac{I_T}{I_t})$ = Future value of distributions $[FV(D)]$
$\sum_{t=1}^{T}(cont_t \times \beta\frac{I_T}{I_t})$ = Future value of contributions $[FV(C)]$

5 Data

The data used in this thesis is obtained through several large LPs who have voluntarily disclosed their portfolios with the requirement that all identifiable characteristics of the GPs, funds, and LPs are anonymized. The anonymization is due to the information not being publicly available, and LPs are generally legally bound not to publicly disclose any information regarding individual funds or GPs. Therefore, this thesis strictly presents aggregated data.

The dataset obtained from the LPs contains information on 207 funds domiciled in Europe with vintages between 1995 and 2022, where a fund's vintage year is defined as the year of the fund´s first investment. The sample includes the complete cash flow statements, net of fees, for all funds, displaying each contribution, distribution, and NAV update with respective date and size. Additionally, the dataset contains supplementary information such as the funds' target industry, fund size, vintage year, and firm domicile.

To ensure that results accurately reflect the true performance, we follow Phalippou (2009) by excluding funds with a vintage year later than 2013 from our sample and, hence, limiting our sample to mature funds with a high realization rate. This exclusion reduces the dependence on NAVs, whose value might not be representative of the actual future realized performance (Phalippou & Gottschalg, 2009; Jenkinson et al., 2013; Phalippou, 2014; L´Her et al., 2016). Furthermore, fund types other than buyout funds, such as fund-of-funds, are excluded from the sample. Fund-of-funds are investment vehicles that invest in several other PE funds. Applying these selection criteria reduces the sample to 141 funds with vintages between 1995 and 2013.

Although our dataset, sourced from European LPs, is smaller than the European market in its entirety, it offers advantages in mitigating potential selection biases typically associated with larger commercially available databases such as Pitchbook and Preqin. Such databases mainly depend on GPs and LPs willingly sharing their data, which can introduce a bias towards over-representing higher-performing funds, as poorer-performing funds can be omitted for reputational reasons (Phalippou and Gottschalg, 2009). By obtaining our sample directly from LPs who remain anonymous, we remove the incentive for LPs to conceal or omit poor-performing funds. Consequently, we deem the dataset used in this study to be of high quality and more likely to represent the broader European

market than some larger datasets from sources prone to selection bias. Second, survivorship bias is commonly present when studying PE funds. The bias is due to low-performing firms being less likely to succeed in raising a follow-on fund. The data could thus only represent the high-performing firms while the poor-performing firms have ceased their operations. While it may not be possible to remove the bias completely, the inclusion of first-time funds in the dataset mitigates the survivorship bias's effect. As such, the dataset is considered to be sufficiently representative and accurate for the purpose of this thesis.

Figure 1 shows the distributions of funds by fund location. As seen by the distribution, roughly 60% of the sampled funds originate from the United Kingdom. The second most represented country is Switzerland, which is the origin country for 9% of funds. Hence, the forthcoming results may be affected by the samples' skewed distribution towards British funds. Despite this, it is likely that this distribution reflects the larger market, as the UK has been the European financial center during our sample period.

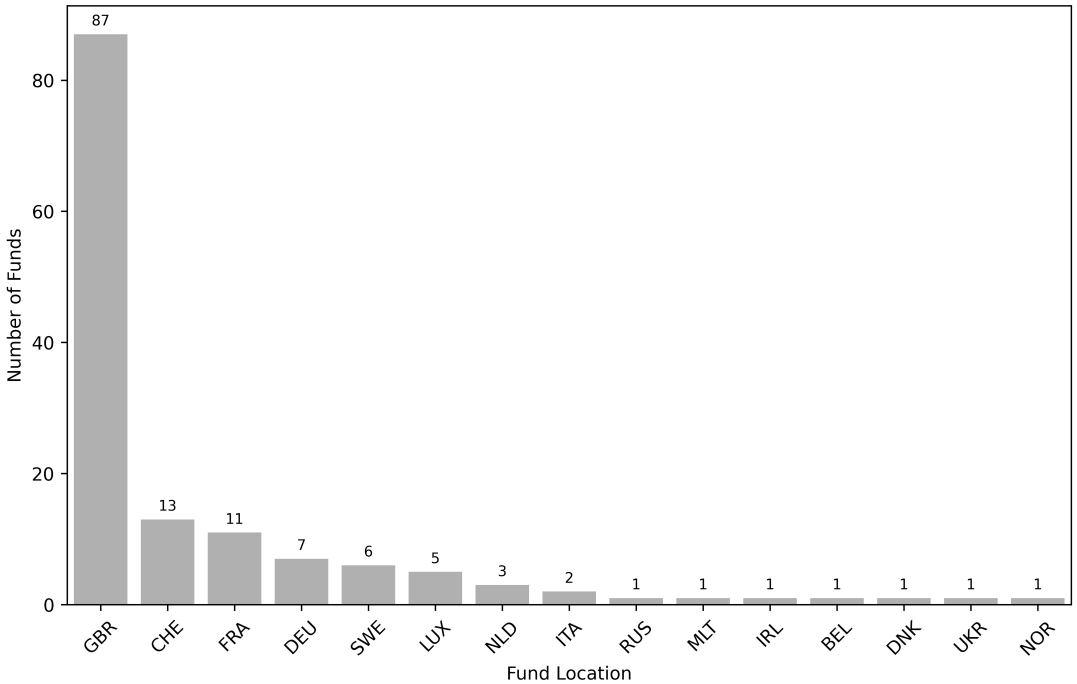

Figure 1: Number of Funds by Location

Furthermore, the majority of countries are only represented by 1 or a few funds. The small amount of funds for these countries prohibits meaningful conclusions to be drawn and could yield misleading results regarding cross-country differences in relative performance. Therefore, when analyzing relative returns between

countries, only countries with 5 or more funds are included.

Table 1 shows the median and mean fund size per vintage year. The table indicates a non-monotonic relationship between fund size and vintage year. This is in contrast to the common perception that fund size increases over time. However, the notion of increasing size is not supported by aggregated data for the included vintage years (Preqin, 2015). For vintage years with a considerable number of observations, the mean fund size is generally larger than the median. This disparity suggests a positive skewness in the distribution, indicating that the presence of a few very large funds significantly increases the mean. Furthermore, we observe decreasing fund sizes for vintages following the financial crisis. Finally, our sample is described in further detail based on fund characteristics in Section 6.3.

Vintage	No. of Obs	Fund Size	
		Median	Mean
1995	1	414	414
1997	2	1669	1669
1998	2	911	911
1999	1	1803	1803
2000	3	3500	2823
2001	7	2032	2390
2002	3	400	1133
2003	3	1500	2383
2004	4	775	1309
2005	11	2697	2952
2006	13	1126	2152
2007	11	859	2019
2008	23	794	1748
2009	8	410	1023
2010	10	498	808
2011	17	182	614
2012	10	848	1368
2013	12	734	813
Sample	141	732	1570

Table 1: Fund Size by Vintage Year

6 Empirical Results

This section presents the results of the traditional performance measurements (Section 6.1), the relative returns obtained through the PME framework and subsequent robustness tests to assess the validity of the results (Section 6.2), and lastly, the results regarding performance determinants (Section 6.3).

6.1 Traditional Performance Measurements

Table 2 presents the two traditional performance measurements, IRR and TVPI, split up per vintage year. The mean, median, and fund-size weighted mean are presented for each measure. Further, the table includes the realization rate, defined as the total distribution divided by the sum of total distributions and the residual NAV. In other words, the realized value of the fund in relation to the total value of the fund, including non-realized assets. Thus, a realization rate of 100% corresponds to a fully liquidated fund.

Vintage	No. of Obs	Realization %	IRR %			TVPI		
			Mean	Median	Weighted Mean	Mean	Median	Weighted Mean
1995	1	100.00	31.00	31.00	31.00	1.92	1.92	1.92
1997	2	100.00	15.46	15.46	15.17	1.94	1.94	2.01
1998	2	99.79	12.35	12.35	12.31	1.84	1.84	1.82
1999	1	100.00	7.80	7.80	7.80	1.42	1.42	1.42
2000	3	99.80	20.43	19.97	20.83	2.15	1.99	2.27
2001	7	98.32	27.06	30.37	32.21	2.35	2.16	2.40
2002	3	99.72	18.67	17.91	17.89	1.92	1.85	1.86
2003	3	99.59	14.50	22.10	21.25	1.91	1.72	1.95
2004	4	85.86	2.14	3.70	2.05	1.19	1.28	1.18
2005	11	97.36	7.91	9.64	8.57	1.57	1.68	1.61
2006	13	95.52	8.52	8.85	9.75	1.67	1.69	1.77
2007	11	97.01	12.01	9.78	8.63	1.70	1.61	1.55
2008	23	92.48	9.09	11.01	12.23	1.58	1.60	1.78
2009	8	88.00	11.68	11.47	12.36	1.75	1.53	1.64
2010	10	86.58	13.39	13.04	10.63	1.73	1.78	1.55
2011	17	69.09	17.30	15.37	17.81	2.15	2.01	2.06
2012	10	78.12	16.17	16.92	16.54	1.86	1.88	1.79
2013	12	61.59	13.73	13.84	16.24	1.80	1.73	1.95
90s	6	99.93	15.74	13.70	13.55	1.82	1.85	1.81
00s	86	94.65	11.52	10.93	13.22	1.71	1.70	1.79
10s	49	72.67	15.40	15.03	15.65	1.92	1.92	1.85
Sample	141	87.23	13.05	12.46	13.69	1.79	1.76	1.80

Table 2: IRR and TVPI by Vintage Year and Decade

The sample median for the IRR and the TVPI is smaller than the respective sample means, indicating that the returns are positively skewed by a set of well-performing funds. Therefore, the median is deemed the appropriate measurement

of central tendency, as it is less affected by high-performing outliers and thus provides a better representation of the return distribution. The spread between the mean and the median does, however, differ between measurements and time periods. The IRR has the largest spreads, while the TVPI exhibits only a marginal divergence between mean and median values. The most extensive divergence is observed for the IRR during the 1990s (seen in the fourth to last row in Table 2), a time period where the mean TVPI is smaller than the median. This suggests that some funds were inclined to realize their investments early to increase their IRR, which has a negative effect on TVPI and thus decreases the mean. Important to acknowledge is that the weighted mean for this period is smaller than both the mean and the median, indicating that the high IRRs are attributable to the smaller funds in the sample. Interestingly, this relationship reverts over the following decades, indicating that larger funds exhibit higher returns compared to smaller funds.

Furthermore, the data exhibit large inter-vintage year variations in returns. One such large variation is seen at the turn of the millennium when the IRR went from 7.8% to 20.43%, then reverting towards lower returns in the years leading up to the financial crisis. These large variations are coherent with the findings of Harris et al. (2014) who also found similar trends in returns. Although both absolute return measurements have large inter-year variations, positive returns are observed for all vintage years.

To evaluate fund performance, the realization rate is essential to observe as it provides insights regarding the accuracy of the reported performances. The results show that funds with vintages prior to the 2010s have a realization rate in the proximity of 100% which entails that the reported performance is primarily based on realized values and should thus be considered accurate. However, the mean realization for funds with vintages after the 2010s is 72.67%, meaning that roughly 27% of the fund value is still unrealized. Following the evidence presented by Jenkinson et al. (2013), the unrealized value of the funds is often valued conservatively, which would, upon liquidation, result in greater returns than shown in these results.

Although the absolute performance measurements do not directly yield information regarding relative performance, they serve as important indicators for the return distribution of our sample and as a basis for comparison to relative performance.

6.2 PME

6.2.1 Relative Performance

Consistent with the existing body of research, this thesis examines the time-dependent trends in relative performance. Table 3 presents the equally weighted mean, median, and weighted mean PME for each vintage year from 1995 to 2013 using the STOXX Europe 600 (STOXX) as the benchmark index. The STOXX index is a value-weighted index containing the 600 largest European companies. The STOXX is chosen as the primary index for this thesis based on three reasons; first, the index is value-weighted, which Sorensen and Jagannathan (2015) argue eliminates the need for assumptions regarding systematic risk; second, the index represents the opportunity cost of capital for a European investor; lastly, the index closely resembles the construction of the S&P 500, the primary index used for studies on U.S. buyout funds. To calculate the weighted mean PME, a value-weighted approach based on fund size is used.

Vintage	No. of Obs	PME		
		Mean	Median	Weighted Mean
1995	1	1.31	1.31	1.31
1997	2	2.33	2.33	2.18
1998	2	2.05	2.05	2.18
1999	1	1.59	1.59	1.59
2000	3	2.16	2.26	2.15
2001	7	2.05	1.97	2.04
2002	3	1.64	1.59	1.53
2003	3	2.00	1.79	2.03
2004	4	1.03	1.08	0.98
2005	11	1.50	1.52	1.55
2006	13	1.39	1.30	1.46
2007	11	1.32	1.22	1.18
2008	23	1.19	1.22	1.37
2009	8	1.39	1.26	1.29
2010	10	1.41	1.41	1.28
2011	17	1.75	1.71	1.69
2012	10	1.63	1.65	1.59
2013	12	1.56	1.52	1.70
90s	6	1.94	1.95	1.99
00s	86	1.43	1.39	1.51
10s	49	1.61	1.58	1.58
Sample	141	1.52	1.49	1.54

Table 3: PME using STOXX Europe 600 by Vintage Year and Decade

The results suggest that, on average, the sample of 141 buyout funds have outperformed the STOXX index by 52% over their lifetimes. The median outperformance is slightly lower at 49%, while the weighted mean PME displays the most substantial outperformance of 54%. The marginally higher value-weighted performance indicates that larger funds have outperformed smaller funds within this sample. Decade-wise, the most significant outperformance is observed during the 1990s, with the mean (median) fund having a PME of 1.94 (1.95). However, since there are only six observations during the 1990s, the results should be interpreted cautiously. During the 2000s, the performance decreased notably with a mean (median) PME of 1.43 (1.39). Although the magnitude of the results obtained differs from previous studies, the time-dependent trends in relative performance are consistent with the findings by L´Her et al., (2016).

On a vintage-year basis, the mean PME is consistently greater than 1, indicating a robust constant overperformance for buyout funds compared to the STOXX index. However, some PMEs, though greater than 1, are close to the threshold. If a better-performing index were to replace the current benchmark, the mean PME for those years would reveal underperformance which signifies the sensitivity to the choice of the benchmark index. The implications of the benchmark index are further evaluated in Section 6.2.5.

The relative performance observed is also significantly greater compared to the previous literature. This is partly due to the choice of the benchmark index. During the sample period, the STOXX index has had a weak relative return compared to U.S. indexes used in prior literature, such as the S&P 500 and the Russel 2000. Further, it is crucial to recognize that the unlevered STOXX index may not be the appropriate benchmark as it does not accurately account for the systematic risk – a topic discussed more extensively in Section 6.2.6.

As previously shown by the realization rates, the later vintages are not yet liquidated. Therefore, since the fund value is not yet fully realized, performance calculations are subject to the unrealized NAV, which may not accurately reflect the true future value of the remaining portfolio companies. As a result, the PME for these funds should be viewed as an approximation of the true relative returns. The subject of sensitivity to NAV is discussed further in Section 6.2.7.

To provide more insights regarding fund performance, we divide the sample into quartiles based on PME. This enables conclusions regarding the distribution of relative performance and whether poor-performing funds generate excess returns

compared to equivalent public equities. Table 4 presents the PME quartiles by decade. In addition, the table presents the number of funds and mean PME by decade.

Decade	No. of Obs	PME			
		Lower Quartile	Median	Upper Quartile	Mean
90s	6	1.65	1.95	2.23	1.94
00s	86	1.17	1.39	1.69	1.43
10s	49	1.32	1.58	1.82	1.61

Table 4: PME Quartiles by Decade

Notably, all quartiles outperform the benchmark index for each of the three decades, which shows that not only funds in the upper quartile generate excess returns. These results differ from the previous findings by Harris et al. (2014), which found outperformance only for median and upper quartile funds. This suggests that structural factors, such as the illiquidity premium and commitment risk, in buyout funds are responsible for the excess returns compared to public equities. Furthermore, we observe similar spreads between the upper and lower quartile for all decades, indicating that although relative returns fluctuate over time, the distribution remains relatively consistent. The distribution of returns thus reaffirms and strengthens the excess performance found by EBFs and serves as evidence that not only upper quartile funds generate excess returns.

In conclusion, the consistent outperformance found on yearly and aggregate levels strongly conveys that EBFs have outperformed public equities during the observed vintage years. In the forthcoming sections, we assess the robustness of the observed excess performance with respect to the variable factors in the PME calculation.

6.2.2 Correlation between Performance Measures

The performance measures, both relative and absolute, present varying results. A correlational analysis is therefore conducted to understand the dynamics between the measurements better. Table 5 presents the correlations for the PME and the traditional performance measurements. A majority of the observed performance measurements are moderately- to highly correlated, which is expected.

	PME	IRR	DPI	TVPI
PME	1.00			
IRR	0.81	1.0		
DPI	0.78	0.76	1.0	
TVPI	0.91	0.87	0.81	1.0

Table 5: Performance Measure Correlations

The largest correlation observed between the TVPI and PME is expected due to the resemblance in calculations. The high correlation between the two measurements suggests that the TVPI, which, unlike the PME, is commonly presented by funds, should be the preferred performance measurement over the IRR as it more accurately reflects the PE fund's performance. Lastly, DPI and TVPI are shown to also be highly correlated at 0.81, further confirming the maturity of the funds in our filtered sample. In general, the difference between these two multiples illustrates the magnitude of the remaining NAVs.

6.2.3 Country-Specific Performance

In order to better understand the variations in relative returns, we examine the PMEs of countries that have 5 or more observations. Possible deviations between countries' relative returns may indicate that geographical factors influence fund performance. Table 6 presents the mean PME for the 6 countries having sufficient observations, using STOXX as the benchmark index. Funds domiciled in Germany are shown to have the highest mean PME of 1.68, whilst funds located in Luxemburg have the lowest mean PME of 1.42. Interestingly, we observe that the three highest-performing countries have similar PMEs whilst the three lowest-performing countries display a larger spread in PME values. The cross-country differences could be attributed to differences in geographically specific factors. However, it is possible that the observed differences are due to the limited sample size.

Country	No. of Obs	PME		
		Min	Mean	Max
CHE	13	0.63	1.50	2.31
DEU	7	1.22	1.68	2.41
FRA	11	1.27	1.63	2.26
GBR	87	0.48	1.53	2.97
LUX	5	1.11	1.42	2.23
SWE	6	0.93	1.66	3.18
Others	12	0.48	1.25	2.65

Table 6: PME by Country

Funds domiciled in the UK have a mean PME of 1.53, which compared to the sample mean PME of 1.52, displays the large impact of UK funds on the previously obtained results. Overall, all considered countries exhibit notable excess returns in comparison to the benchmark index.

6.2.4 Sensitivity to Benchmark Index

Thus far, our relative return calculations are based on the STOXX index, which reflects the opportunity cost of capital for investing in EBFs. However, other benchmark indexes could more accurately reflect the characteristics of the underlying portfolio companies, such as size and maturity. Thus, this section focuses on examining the robustness of our previous results with respect to various benchmark indexes which account for different company characteristics.

The first alternative European benchmark index used is the MSCI Europe index, a large- and mid-cap index representing 15 developed markets in Europe. The index is included to observe the relative returns robustness to a narrower index composition compared to STOXX. The second benchmark index is the MSCI Europe Value, a large- and mid-cap index constituting companies displaying value characteristics. The index is included based on the reasoning by Phalippou (2014), who argues that the average portfolio company of a buyout fund displays value characteristics. Furthermore, the S&P 500 is included as a benchmark index as it is frequently used by previous research, thus enabling us to draw more accurate comparisons with previous findings. To observe the sensitivity of our findings with respect to the choice of the benchmark index, Table 7 presents the mean PME by vintage year, decade, and the sample as a whole.

Vintage	PME			
	STOXX	S&P	MSCI	MSCI Value
1995	1.31	1.36	1.43	1.39
1997	2.33	2.03	1.93	1.75
1998	2.05	1.83	1.76	1.73
1999	1.59	1.43	1.32	1.28
2000	2.16	2.00	1.91	2.00
2001	2.05	1.98	1.95	2.10
2002	1.64	1.57	1.66	1.83
2003	2.00	1.79	1.98	2.27
2004	1.03	0.77	1.12	1.30
2005	1.50	1.16	1.64	1.94
2006	1.39	1.05	1.59	1.86
2007	1.32	1.04	1.53	1.73
2008	1.19	0.91	1.37	1.55
2009	1.39	1.05	1.57	1.81
2010	1.41	1.10	1.58	1.78
2011	1.75	1.30	1.95	2.26
2012	1.63	1.24	1.72	1.95
2013	1.56	1.16	1.64	1.89
90s	1.94	1.75	1.69	1.61
00s	1.43	1.17	1.56	1.78
10s	1.61	1.21	1.75	2.01
Sample	1.52	1.21	1.63	1.85

Table 7: PME by Vintage Year, Decade and Index. The indexes in order are STOXX Europe 600, S&P 500, MSCI Europe, MSCI Europe Value

For our sample, the sample- and decade-mean PMEs all exceed 1 using the three alternative benchmark indexes, although the magnitude of the sample means differs significantly between the benchmarks. The largest excess performance is found for the MSCI value index, which reports a mean PME of 1.85, driven by the high PMEs for the 2000s and 2010s vintages. This result was expected as the other benchmark indexes have significantly outperformed the index. Moreover, the decade means for all benchmarks are greater than 1, which provides additional evidence of the robustness of excess returns to changes in benchmarks.

Similar to the finding of Harris et al. (2015), we observe high PME values for the 1990s and the first years of the 2000 decade when using the S&P 500 as a benchmark index. Further, we also observe PME values close to 1 for the funds with vintages in the years leading up to the financial crisis. Additionally, the

decade and sample means for the S&P 500 benchmark are in close proximity to the findings of several earlier papers studying the relative performance of U.S. buyouts, indicating that European and U.S. buyout funds perform similarly (L´Her et al., 2016; Brown & Kaplan, 2019; Harris et al., 2022).

Overall, results show that the PME calculation is highly sensitive to the choice of the benchmark index. For the purpose of evaluating the relative performance of funds, it is important to closely regard the implications of employing a particular index. However, with only two vintages having a sub-par performance compared to the S&P 500 index and sample means exceeding 1, the results show that the previously found excess performance is robust to changes in public market benchmarks.

6.2.5 Sensitivity to Net Asset Value

The NAV for a PE fund can be problematic due to the accuracy of estimating the true value of the underlying companies. Although our sample only contains mature funds, the NAV still influences the PME calculations, especially for later vintage years. As previously mentioned, the NAV calculations are commonly found to be restrictive, however, the calculations are still reliant upon subjective assessments and could be overstated based on GP incentives. By removing the NAV from the PME calculations, the resulting relative performance will be misleading. However, the NAV-redacted PME could still be used to draw conclusions if excess performance is found. Table 8 presents the PME by vintage year, including and excluding NAV, based on the previously used benchmark indexes. In addition, the table displays both the decade- and sample means, as well as the realization rate.

Vintage	Realization	PME incl. NAV				PME excl. NAV			
		STOXX	S&P	MSCI	MSCI Value	STOXX	S&P	MSCI	MSCI Value
1995	100.00	1.31	1.36	1.43	1.39	1.31	1.36	1.43	1.39
1997	100.00	2.33	2.03	1.93	1.75	2.33	2.03	1.93	1.75
1998	99.79	2.05	1.83	1.76	1.73	2.05	1.83	1.75	1.73
1999	100.00	1.59	1.43	1.32	1.28	1.59	1.43	1.32	1.28
2000	99.80	2.16	2.00	1.91	2.00	2.15	2.00	1.91	1.99
2001	98.32	2.05	1.98	1.95	2.10	2.02	1.97	1.93	2.06
2002	99.72	1.64	1.57	1.66	1.83	1.64	1.57	1.66	1.82
2003	99.59	2.00	1.79	1.98	2.27	2.00	1.78	1.97	2.26
2004	85.86	1.03	0.77	1.12	1.30	0.83	0.64	0.91	1.06
2005	97.36	1.50	1.16	1.64	1.94	1.47	1.14	1.60	1.89
2006	95.52	1.39	1.05	1.59	1.86	1.36	1.03	1.55	1.81
2007	97.01	1.32	1.04	1.53	1.73	1.28	1.02	1.49	1.67
2008	92.48	1.19	0.91	1.37	1.55	1.11	0.87	1.27	1.43
2009	88.00	1.39	1.05	1.57	1.81	1.21	0.93	1.36	1.55
2010	86.58	1.41	1.10	1.58	1.78	1.25	1.00	1.39	1.55
2011	69.09	1.75	1.30	1.95	2.26	1.26	0.98	1.37	1.55
2012	78.12	1.63	1.24	1.72	1.95	1.33	1.04	1.39	1.54
2013	61.59	1.56	1.16	1.64	1.89	1.01	0.77	1.04	1.18
90s	99.93	1.94	1.75	1.69	1.61	1.94	1.75	1.69	1.61
00s	94.65	1.43	1.17	1.56	1.78	1.37	1.13	1.49	1.68
10s	72.67	1.61	1.21	1.75	2.01	1.21	0.95	1.30	1.46
Sample	87.23	1.52	1.21	1.63	1.85	1.34	1.09	1.43	1.60

Table 8: PME by Vintage Year and Decade, Including and Excluding the Net Asset Value

Contrary to the findings of Phalippou and Gottschalg (2009), we find no evidence of underperformance when deducting the NAV from the PME calculated with the STOXX index. Furthermore, we find sample mean PMEs to be greater than 1 for all observed benchmarks. However, the high realization rates of the 1990s and 2000s fund vintages results in minor decreases in observed excess performance, thus increasing the sample means. Hence, the vintage decade of interest is the 2010s, which displays a significant decrease in relative performance, although remaining positive across the European benchmarks.

In conclusion, even though we remove the NAV in its entirety, which is inaccurately depicting the performance, we observe significant excess returns across all European indexes. Therefore, we deem the excess performance to be robust to inaccurately reported NAVs as the relative returns all greatly exceed 1. The underperformance observed with the S&P 500 benchmark cannot be used to draw conclusions regarding the robustness of our results as it fails to reflect the opportunity cost of capital for investments in EBFs.

6.2.6 Sensitivity to Systematic Risk

The PME methodology does not account for varying levels of systematic risk and implicitly assumes the distributions and contributions to have a beta of one. As this assumption may not hold, the tailored PME is commonly used as a control measurement. Table 9 shows the tailored PME by vintage year and decade for different levels of systematic risk, which were simulated by levering the STOXX index with beta values ranging from 1 to 2. Consistent with previous literature, we used beta values of 1, 1.1, 1.2, 1.3, 1.5, and 2 to account for the whole spectrum of plausible beta values.

Vintage	PME					
	$\beta = 1.0$	$\beta = 1.1$	$\beta = 1.2$	$\beta = 1.3$	$\beta = 1.5$	$\beta = 2.0$
1995	1.31	1.28	1.25	1.23	1.20	1.56
1997	2.33	2.41	2.51	2.62	2.91	4.90
1998	2.05	2.11	2.19	2.29	2.55	4.65
1999	1.59	1.64	1.69	1.76	1.92	2.73
2000	2.16	2.20	2.26	2.33	2.57	5.45
2001	2.05	2.06	2.08	2.11	2.24	4.04
2002	1.64	1.64	1.65	1.67	1.75	2.84
2003	2.00	2.07	2.15	2.25	2.56	6.07
2004	1.03	1.03	1.02	1.03	1.04	1.15
2005	1.50	1.52	1.55	1.59	1.71	2.64
2006	1.39	1.38	1.37	1.36	1.36	1.44
2007	1.32	1.29	1.27	1.24	1.20	1.13
2008	1.19	1.16	1.13	1.10	1.05	0.95
2009	1.39	1.37	1.34	1.32	1.27	1.18
2010	1.41	1.38	1.36	1.34	1.29	1.20
2011	1.75	1.73	1.70	1.67	1.62	1.52
2012	1.63	1.62	1.60	1.59	1.56	1.52
2013	1.56	1.54	1.53	1.51	1.49	1.45
90s	1.94	1.99	2.06	2.13	2.34	3.90
00s	1.43	1.43	1.42	1.42	1.45	1.95
10s	1.61	1.59	1.57	1.55	1.51	1.44
Sample	1.52	1.51	1.50	1.50	1.51	1.85

Table 9: Mean Levered PME by Vintage Year and Decade using a β of 1.1, 1.2, 1.3, 1.5 and finally 2.0. The Index used is STOXX Europe 600.

Similar to earlier literature, we find, in the last row of Table 9, a somewhat convex relationship between beta and relative performance (Harris et al. 2014; Robinson & Sensoy. 2016). The sample mean PME for various beta values

is in close proximity to each other, except for the simulated beta of 2, which yields a PME of 1.85. However, a beta value of 2 is arguably misrepresentative of the systematic risk and should therefore be seen as a control value for the other results. Therefore, when considering the sample as a whole, the results do not indicate that the systematic risk is explanatory of the excess relative performance as the relative return is insensitive to varying beta levels. However, the sensitivity to different beta values varies across vintage years and decades. During the 1990s, there is a positive relationship between relative performance and beta, which is nonexistent during the two other observed decades. This could be attributed to the funds in our sample having their inception around the time of the dot-com crash, which had a substantial negative impact on the benchmark index, particularly when leveraged, resulting in higher relative returns.

In summary, the results provide strong evidence that the excess relative performance is robust to various levels of systematic risk. Albeit different beta values may decrease relative performance in certain vintage years, there is still an excess performance for all observed beta values. Considering the marginal differences in relative performance across various beta values at an aggregate level, this finding suggests that systematic risk may not be a deciding factor in generating excess performance.

6.3 Performance Determinants

In this section, we assess the relationship between the hypothesized performance determinants and the relative performance of EBFs. The hypothesized performance determinants are the fund size, GP experience, and target industry. The analysis is conducted by studying the distributions of returns based on the hypothesized performance determinants and performing regressional analysis.

6.3.1 Fund Size

The first hypothesized performance determinant is the fund size, defined as the sum of capital commitments. The effect of fund size on performance is of concern for academia and stakeholders, given the significant implications on allocations to the asset class. In Table 10 we classify our sample into fund size quartiles by decade. The median fund size has decreased from €1051 million in the 1990s to €496 million in the 2010s. This peculiar relationship in the data is the opposite of the global trend where the mean fund size has marginally increased over time.

Table 10 further presents the PMEs by fund size quartile for the whole sample. Although fixed effects are not considered, the size quartiles do not display a significant relationship between fund size and relative returns. Contrary to Harris et al. (2014) we do not observe the smallest fund quartile to exhibit lower returns than larger quartiles, instead we obtain more evenly distributed performance across fund sizes.

	No. of Obs	Bottom Quartile	Median	Top Quartile	Mean
Decade		Size Cutoffs (€ Millions)			
90s	6	480	1051	1708	1230
00s	86	504	912	3400	2000
10s	49	182	496	1128	856
Fund Size		PME			
Small Funds	35	1.27	1.48	1.84	1.52
2nd Size Quartile	35	1.14	1.47	1.71	1.49
3rd Size Quartile	35	1.22	1.59	1.80	1.54
Large Funds	36	1.25	1.53	1.77	1.51

Table 10: Fund Size Quartiles by Decade and PME Quartiles by Fund Size Quartiles

To investigate the relationship further, Table 11 presents PME regressions on fund size quartiles in three different model specifications. To study the fund size determinant, fund size is included as dummy variables representing the size quartiles following the methodology used by Harris et al. (2014). As expected, the first model specification, which includes no control variables, shows no explanatory power. When including vintage year to control for year-fixed effects in model 2, the model's explanatory power increases drastically. However, we do not observe a significant relationship between fund size and relative returns. When controlling for vintage years and country-fixed effects, the model's explanatory power further increases, although the coefficients remain insignificant. These findings are consistent with Ljungqvist and Richardson (2003) and Harris et al. (2014), who find no evidence of size-related effects on performance.

	Dependent variable: PME		
	Model 1	Model 2	Model 3
	(1)	(2)	(3)
2nd Size Quartile	-0.03	-0.06	-0.02
	(0.10)	(0.09)	(0.10)
3rd Size Quartile	0.02	0.09	0.09
	(0.12)	(0.11)	(0.12)
4th Size Quartile	-0.01	-0.03	-0.08
	(0.09)	(0.08)	(0.09)
Intercept	1.52***	1.38***	0.97***
	(0.06)	(0.09)	(0.20)
Vintage year dummies	No	Yes	Yes
Country dummies	No	No	Yes
Observations	141	141	141
R^2	0.00	0.38	0.50
Adjusted R^2	-0.02	0.27	0.34
Residual Std. Error	0.48(df = 137)	0.40(df = 120)	0.38(df = 106)
F Statistic	0.06 (df = 3.0; 137.0)	6.87*** (df = 20.0; 120.0)	10.31*** (df = 34.0; 106.0)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 11: Regression of Fund Size Quartiles on PME

6.3.2 GP Experience

The second hypothesized determinant is the experience of fund GPs. We define GP experience as a binary variable that takes on the value 1 if the fund is a non-first-time fund. The variable is constructed in conjunction with the methodology used by earlier literature (Kaplan & Schoar, 2005; Harris et al., 2014). Table 12 shows the characteristics of the sample between first-time funds and non-first-time funds. The small number of first-time funds is expected, as LPs tend to invest in seasoned GPs. Interestingly, first-time funds have similar performance characteristics to non-first-time funds.

		PME			
GP Experience	No. of Obs	Bottom Quartile	Median	Top Quartile	Mean
0	14	1.24	1.51	1.8	1.47
1	127	1.23	1.49	1.8	1.52

Table 12: PME Quartiles by GP Experience

Table 13 presents three regression models with GP experience as the independent variable and PME as the dependent variable. With each model, controlling first for year fixed effects (model 2) and then also including country fixed effects (model 3), we see the adjusted R-square increase substantially. In other words,

including year- and country dummies substantially help explain the variation in PME. Moreover, the lack of significance of GP experience suggests that the variable, as defined in this study, is not a significant driver of performance. As an alternative specification to the current determinant definition, three additional regressions were done using GPs' experience defined as the natural logarithm of the fund's sequence number. However, the outcomes were similar in all aspects to the current binary definition and are thus excluded.

	Dependent variable: PME		
	Model 1	Model 2	Model 3
	(1)	(2)	(3)
GP Experience	0.06	0.01	0.01
	(0.10)	(0.08)	(0.10)
const	1.47***	1.31***	0.93***
	(0.09)	(0.08)	(0.19)
Vintage year dummies	No	Yes	Yes
Country dummies	No	No	Yes
Observations	141	141	141
R^2	0.00	0.36	0.48
Adjusted R^2	-0.01	0.27	0.33
Residual Std. Error	0.47(df = 139)	0.40(df = 122)	0.39(df = 108)
F Statistic	0.30 (df = 1.0; 139.0)	8.52*** (df = 18.0; 122.0)	11.13*** (df = 32.0; 108.0)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 13: Regression of GP Experience on PME

6.3.3 Target Industry

The third hypothesized performance determinant is the presence of a defined target industry. A defined target industry indicates that the GP is skilled within this sector and should thus yield higher excess returns than funds without a specific target industry. In addition, we have classified the target industries of the funds into 8 distinct sectors based on the classification system used by Ick (2005). This allows for meaningful comparisons to be made among the different industries. Table 14 shows the PME distributions for the defined target industries. Notably, the mean PME values indicate that funds without a defined target industry generate lower relative returns than those with a target industry, suggesting that GP experience within a target industry yields higher returns. Another noticeable finding when observing the mean values is that funds targeting the consumer discretionary sector seem to underperform funds with other target industries.

For funds with a target industry, the variation in relative return is commonly found to be higher within the target industry group than between different target industries. This suggests that certain target industries are not inherently worse performing than others. Instead, other macro- or fund-specific factors may have greater explanatory power of PE returns.

		PME			
Target Industry	No. of Obs	Bottom Quartile	Median	Top Quartile	Mean
TMT	47	1.28	1.58	1.80	1.55
Services	91	1.22	1.51	1.71	1.48
Natural Resources	6	1.24	1.35	1.43	1.40
IT	31	1.17	1.47	1.78	1.49
Industrial Production	70	1.28	1.56	1.83	1.58
Healthcare	24	1.19	1.27	1.68	1.49
Financial Services	16	1.38	1.58	1.81	1.55
Consumer Discretionary	32	1.03	1.26	1.60	1.32
No Target Industry	13	1.25	1.33	1.59	1.32

Table 14: PME Quartiles by Industry Classification

To gain further insights regarding the target industry-specific effects on relative performance, Table 15 presents a regression analysis. Following the methodology used to test the previous hypotheses regarding performance determinants, three models are used. As indicated by the PME distribution above, the consumer discretionary sector is found to be significantly negatively correlated with relative performance for all three model specifications. This finding is unsurprising as recent research has found consumer discretionary to be the worst-performing sector for buyout funds (Bain, 2022). Furthermore, the results show that funds having natural resources (TMT) as target industry yield lower (higher) relative returns, although at lower significance levels.

	Dependent variable: PME		
	Model 1	Model 2	Model 3
	(1)	(2)	(3)
Consumer Discretionary	-0.23**	-0.24***	-0.24***
	(0.10)	(0.08)	(0.09)
Financial Services	0.01	0.10	0.10
	(0.09)	(0.09)	(0.10)
Healthcare	-0.00	0.02	-0.01
	(0.10)	(0.09)	(0.10)
IT	-0.07	-0.07	-0.06
	(0.09)	(0.08)	(0.08)
Industrial Production	0.15*	0.08	0.04
	(0.09)	(0.07)	(0.08)
Natural Resources	-0.22*	-0.18	-0.25*
	(0.12)	(0.13)	(0.14)
Services	-0.10	-0.04	-0.02
	(0.09)	(0.08)	(0.08)
TMT	0.12	0.16**	0.15*
	(0.08)	(0.08)	(0.08)
const	1.54***	1.52***	1.55***
	(0.09)	(0.14)	(0.16)
Vintage year dummies	No	Yes	Yes
Country dummies	No	No	Yes
Observations	141	141	141
R^2	0.09	0.43	0.54
Adjusted R^2	0.04	0.31	0.37
Residual Std. Error	0.46(df = 132)	0.39(df = 116)	0.38(df = 103)
F Statistic	2.05** (df = 8.0; 132.0)	6.08*** (df = 24.0; 116.0)	10.52*** (df = 37.0; 103.0)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 15: Regression of Target Industry Dummies on PME

Table 16 presents PME regressions on the number of target industries per fund to further investigate the relationship between an industry focus and relative performance. Based on the above-presented results, the observed overall insignificance of having 1 target industry on the relative performance is surprising. However, the prominent result is that having 2-4 target industries is positively significant across the three models, although with varying significance. One possible explanation for the positive linear relationship between having a small number of target industries and relative performance could be that by being limited to a few target industries, the GP has a sufficiently broad investment universe to find good investment opportunities without diluting its industry expertise on a large set of industries.

Interestingly, the coefficient for having 5-8 target industries equals zero in the third model, which controls for both year- and country-fixed effects. Essentially, the result suggests that having a too-wide spectrum of investable sectors does not offer an observable advantage over funds with zero targeted industries, as

demonstrated by the null coefficient. The implication is that funds with no target industry, represented by the constant in the regression, have similar returns to those with a broad range of 5-8 target industries.

	Dependent variable: PME		
	Model 1	Model 2	Model 3
	(1)	(2)	(3)
1 target	0.29	0.28*	0.22
	(0.18)	(0.16)	(0.17)
2-4 targets	0.20*	0.23**	0.24**
	(0.12)	(0.12)	(0.12)
5-8 targets	0.11	0.14	0.00
	(0.17)	(0.18)	(0.19)
const	1.32***	1.32***	1.36***
	(0.12)	(0.16)	(0.17)
Vintage year dummies	No	Yes	Yes
Country dummies	No	No	Yes
Observations	141	141	141
R^2	0.02	0.38	0.50
Adjusted R^2	0.00	0.29	0.36
Residual Std. Error	0.47(df = 137)	0.40(df = 121)	0.38(df = 108)
F Statistic	1.23 (df = 3.0; 137.0)	5.65*** (df = 19.0; 121.0)	14.13*** (df = 32.0; 108.0)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 16: Regression of the Number of Target Industries per Fund on PME

6.4 Limitations

This final section of the analysis serves as a discussion that will highlight the various limitations of this study. First, our intention to contribute to the existing literature by focusing on the relatively smaller and less-investigated European PE market naturally led us to obtain a smaller sample size. However, this also allowed us to seek out European LPs for data which resulted in the successful collection of fund-level cash-flow data for 207 different funds, albeit only 141 funds were considered mature. Once funds were further divided by various characteristics, the 141 funds turned out to be a meager number to find significant relationships for certain years and other features. Notably, significant relationships for performance in the 90s, for some countries, and the data for a more robust definition of experienced GPs were limited.

Our pursuit for the 'best' benchmark led us to include a section dedicated to the sensitivity of PMEs to benchmarks and Robinson and Sensoy's (2016) tailored PME. The concern is that a benchmark should be similar to the investment in terms of characteristics, such as company size, leverage, and maturity. As seen

in Table 7, depending on whether STOXX or S&P 500 is used as the benchmark, the mean PME differs significantly from 1.52 to 1.21. Although both tailored PMEs overperform the indexes, any index that is found to be a better fit to reflect the previously stated characteristics might result in underperformance. Aside from similar performance results to previous studies (Kaplan & Schoar, 2005; Phalippou, 2014; Robinson & Sensoy, 2016; Harris et al., 2020), we subject ourselves to the same never-ending uncertainty of whether the most appropriate benchmark is used. Furthermore, differences in exchange rates between Euros and U.S. dollars are not considered when using the S&P 500. This limits definite conclusions to be drawn regarding excess performance. However, it serves as illustrative for comparison to previous research.

The limited significant results from the hypothesized determinant GP experience can be divided into two main parts: the sample and the definition of when a GP is considered experienced. Numerous studies focus on the persistence of performance, which refers to funds within the same fund family consistently outperforming the public markets, mainly attributed to GP experience (Kaplan & Schoar, 2005; Phalippou & Gottschalg, 2009; Hochberg et al., 2014). There are many approaches to do this depending on data availability. However, this approach requires vast information, as the fund type, fund focus, and geography are necessary to determine if a GP can be considered experienced. For example, if an experienced fund manager starts a fund in an entirely different domain, be it geographic or another sectoral focus compared to their previous funds, should this GP be considered experienced? We think not. Therefore, the chosen approach involved a simplified definition of GP experience, given our small sample.

7 Conclusion and Further Research

Existing research on PE performance is mainly conducted on combined U.S. and EU- or standalone U.S. datasets. Therefore, this paper chose a strictly European dataset, as this was an underrepresented geography. Further, the inconclusive findings of earlier research on relative PE performance and certain determinants demand further research on the European PE market. Consequently, this paper investigates the performance of EBFs through the PME framework and absolute return measurements. Furthermore, the paper studies the effect on performance by hypothesized performance determinants, intending to provide valuable insights for LPs and academia alike.

Findings on absolute performance reveal a right-skewed distribution in performance, meaning that some top-performing funds skew the mean upwards. Further, the weighted mean IRR for 90s funds reveals that the top-performing funds are more likely to be of smaller fund size. Meanwhile, funds during the latter two decades until the end of sample data in 2013 indicate an opposite distribution where larger funds seem to generate greater IRRs. Moreover, large inter-year variations are found throughout the data, indicating that performance is susceptible to exogenous effects. Despite these findings, absolute performance measurements, although favored by the PE industry, cannot be compared to the returns of public equities due to underlying differences in return calculations. While traditional performance measurements are shown to be indicative, they cannot be used to conclude excess returns. Therefore, this paper adopts the PME framework for the subsequent analysis.

The aggregate results obtained through the PME methodology strongly support the existence of excess performance for EBFs. We find a mean PME of 1.52, indicating that funds, on average, outperform the public markets by 52% over their lifetime. Moreover, movements across decades in performance align with previous literature, namely a well-performing 1990s, deteriorating returns during the 2000s, and an upward trend in performance with funds started in the early 2010s. A breakdown into performance quartiles reveals a mean outperformance for each quartile group, suggesting that not only European funds in the top-quartile consistently outperform the public market. As a further testament to the outperformance of EBFs, we find the relative returns to be robust to various assumptions regarding appropriate benchmark indexes, inaccurately

measured NAVs, and systematic risk. Therefore, our first hypothesis—that EBFs outperform public markets—is confirmed.

Cross-sectional regressions on PME using quartiles of fund size as independent variables, controlling for year- and country-fixed effects, did not find significant relationships between fund size and excess performance. Similar regressions for GP experience show a non-significant relationship with very low coefficients. The disappointing results are likely explained due to our definition of GP experience, as the quartile performance breakdown in GP experience reveals nearly identical performance for first-time and non-first-time funds. Using the natural logarithm of the fund's sequence number resulted in similar findings. However, the subjective nature of experience renders it to be measured in multiple ways. Hence, our insignificant results do not exclude that experience is affecting performance. Therefore, we suggest future research to approach and define the GP experience differently to find any meaningful relationship. Altogether, we cannot confirm our second and third hypotheses; fund size has a positive impact on performance, and GP experience has a positive impact on performance.

The structure of the target industry determinant allowed for two defining cross-sectional regressions. The first model finds consumer discretionary and natural resources to perform 24% and 25% worse over fund lifetime than those without sectoral focus at 1% and 10% significance levels. Worth noting is that only six funds in our sample had natural resources as a specified industry target. Further statistically significant findings suggest TMT to be an out-performing industry, while natural resources perform worse. The second model shows 2-4 specified target industries as a sweet spot between too few and too many. This finding is rational since targeting only one industry severely limits the investment universe, while having too many industries seems equivalent to having no target industries. To conclude, we find that the impact on performance varies depending on the number and type of target industries. Consequently, our fourth and final hypothesis—that a focused target industry for EBFs has a positive impact on performance—receives mixed evidence.

Finally, despite benchmarking against a public equity index, which captures the opportunity cost of capital between the two asset classes, PE as an asset class still contains additional risks. These include liquidity restrictions imposed on LPs over long time periods and uncertainty around cash flow timings. However, as previously discussed, these factors might explain the significant outperfor-

mance observed. Therefore, accurately estimating the true cost of investing in PE serves as an intriguing area for future research, testing whether the excess performance we uncover truly stands against the additional costs. Meanwhile, further exploration of performance determinants remains a compelling frontier.

8 Reference List

Ang, A., Chen, B., Goetzmann, W., & Phalippou, L. (2018). Estimating Private Equity Returns from Limited Partner Cash Flows. The Journal of Finance (New York), 73(4), 1751-1783.

Ang, A., Papanikolaou, D., & Westerfield, M. (2014). Portfolio Choice with Illiquid Assets. Management Science, 60(11), 2737-2761.

Bain. (2022). Global Private Equity Report 2022. https://www.bain.com/globalassets/noindex/2022/bain_report_global-private-equity-report-2022.pdf.

Brown, G., Gredil, O., & Kaplan, S. (2019). Do private equity funds manipulate reported returns? Journal of Financial Economics, 132(2), 267-297.

Brown, G., & Kaplan, S. (2019). Have Private Equity Returns Really Declined? The Journal of Private Equity, 22(4), 11-18.

Burth, B., & Reißig-Thust, S. (2019). Private equity deal success and pre-acquisition determinants - empirical evidence from Germany. Applied Economics, 51(2), 141-154.

Diller, C., & Kaserer, C. (2009). What Drives Private Equity Returns?- Fund Inflows, Skilled GPs, and/or Risk? European Financial Management : The Journal of the European Financial Management Association, 15(3), 643-675.

Driessen, J., Lin, T., & Phalippou, L. (2012). A New Method to Estimate Risk and Return of Nontraded Assets from Cash Flows: The Case of Private Equity Funds. Journal of Financial and Quantitative Analysis, 47(3), 511-535.

Gohil, R., & Vyas, V. (2016). Factors Driving Abnormal Returns in Private Equity Industry: A New Perspective. The Journal of Private Equity, 19(3), 30-36.

Harris, R., Jenkinson, T., & Kaplan, S. (2014). Private Equity Performance: What Do We Know? The Journal of Finance (New York), 69(5), 1851-1882.

Harris, R., Jenkinson, T., & Kaplan, S. (2015). How Do Private Equity Investments Perform Compared to Public Equity? (Working Paper No. 2597259). http://dx.doi.org/10.2139/ssrn.2597259.

Harris, R., Jenkinson, T., Kaplan, S., & Stucke, R. (2020). Has Persistence

Persisted in Private Equity? Evidence from Buyout and Venture Capital Funds. NBER Working Paper Series, NBER Working Paper Series, 2020.

Higson, C., & Stuke, R. (2012). The Performance of Private Equity. http://dx.doi.org/10.2139/ssrn.2009067.

Hochberg, Y., Ljungqvist, A., & Vissing-Jørgensen, A. (2014). Informational Holdup and Performance Persistence in Venture Capital. The Review of Financial Studies, 27(1), 102-152.

Ick, M. (2005). Performance Measurement and Appraisal of Private Equity Investments Relative to Public Equity Markets. http://dx.doi.org/10.2139/ssrn.871931.

InvestEurope. (2023) Fundraising Data Analysis. https://www.investeurope.eu/research/activity-data/fundraising/.

Ilmanen, A., Chandra, A., & McQuinn, N. (2020) Demystifying illiquid assets: Expected returns for private equity. The Journal of Alternative Investments 22(3), 8-22.

Jenkinson, T. Sousa, M. and Stucke, R. (2013) How Fair are the Valuations of Private Equity Funds? http://dx.doi.org/10.2139/ssrn.2229547.

Kaplan, S., & Schoar, A. (2005). Private Equity Performance: Returns, Persistence, and Capital Flows. The Journal of Finance (New York), 60(4), 1791-1823.

Kaplan, S., & Sensoy, B. (2015). Private Equity Performance: A Survey. Annual Review of Financial Economics, 7(1), 597-614.

Kaplan, S., & Strömberg, P. (2009). Leveraged Buyouts and Private Equity. The Journal of Economic Perspectives, 23(1), 121-146.

Kaserer, C. & Diller, C. (2004). European Private Equity Funds - a Cash Flow Based Performance Analysis. (CEFS Working Paper No. 2004-01). http://dx.doi.org/10.2139/ssrn.547142.

Larocque, S., Shive, S. & Stevens, J. S. (2022). Private Equity Performance and the Effects of Cash-Flow Timing. The Journal of Portfolio Management Private Markets, 48 (9) 86-102

L'her, J., Stoyanova, R., Shaw, K., Scott, W., & Lai, C. (2016). A bottom-up approach to the risk-adjusted performance of the buyout fund market. Financial Analysts Journal, 72(4), 36-48.

Ljungqvist, A., & Richardson, M. (2003). The cash flow, return and risk characteristics of private equity. (NBER Working Paper Series No 9454).

Ljungqvist, A., Richardson, M., & Wolfenzon, D. (2020). The investment behavior of buyout funds: Theory and evidence. Financial Management, 49(1), 3-32.

Loos, R., & Schwetzler, B. (2017). Fueling the buyout machine: Fundraising in private equity. Financial Markets and Portfolio Management, 31(4), 397-443.

Metrick, A., & Yasuda, A. (2010). The Economics of Private Equity Funds. The Review of Financial Studies, 23(6), 2303-2341.

Phalippou, L. (2011). Why is the Evidence on Private Equity Performance So Confusing? http://dx.doi.org/10.2139/ssrn.1864503.

Phalippou, L. (2014). Performance of buyout funds revisited? REVIEW OF FINANCE, 18(1), 189-218.

Phalippou, L., & Gottschalg, O. (2009). The Performance of Private Equity Funds. The Review of Financial Studies, 22(4), 1747-1776.

Preqin. (2015). Does Size really matter?. https://docs.preqin.com/newsletters/pe/Preqin-PESL-Aug-15-Does-Size-Really-Matter.pdf.

Robinson, D., & Sensoy, B. (2016). Cyclicality, performance measurement, and cash flow liquidity in private equity. Journal of Financial Economics, 122(3), 521-543.

Sharma, S., Malik, K., Kaur, M., & Saini, N. (2023). Mapping research in the field of private equity: A bibliometric analysis. Management Review Quarterly, 73(1), 61-89.

Sorensen, M., & Jagannathan, R. (2015). The Public Market Equivalent and Private Equity Performance. Financial Analysts Journal, 71(4), 43-50.

Stucke, R. (2011). Updating History. SSRN Electronic Journal.

Zeisberger, C., Prahl, M. & White, B. (2017). Mastering Private Equity - Transformation via Venture Capital, Minority Investments & Buyouts. 1st Edition. Hoboken: Wiley.