

Excess Returns of Listed Private Equity

Edward Flyborg¹ Emil Holmström²

Stockholm School of Economics

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ABSTRACT

We investigate the performance of listed private equity (LPE) on a sample of 17 LPE entities that are listed equivalents of traditional buyout funds over the period 2007 to 2014. We find an average risk-adjusted underperformance or negative “alpha” of 2.4% per year relative to small cap indices, and document a wide dispersion in returns. The results hold also for post-crisis performance. In controlling for systematic risk, we lever the benchmark indices to replicate the operating and leverage risk of LPE entities. Our estimation of gross-of-fees performance suggests that the average LPE entity adds value in investments. Our findings correspond to those of recent literature on performance of non-listed funds.

Keywords: Listed Private Equity, Buyouts, Risk-adjusted Performance

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¹ 21896@student.hhs.se

² 21879@student.hhs.se

Contents

1	Introduction	3
2	Background and Related Literature	4
2.1	Structure of private equity.....	4
2.1.1	Non-listed funds	4
2.1.1.1	Primary funds	4
2.1.1.2	Secondary funds.....	5
2.1.2	Listed entities.....	5
2.1.2.1	Funds.....	5
2.1.2.2	Investment companies.....	5
2.1.2.3	Funds of funds	6
2.1.2.4	Firms	6
2.2	Related literature on private equity.....	6
2.2.1	Non-listed funds	6
2.2.1.1	Measurement techniques	6
2.2.1.2	Empirical evidence.....	7
2.2.2	Listed entities.....	9
3	Sample and Data	10
3.1	Sample generation.....	10
3.2	Sample descriptives and validity of data	11
3.2.1	Structure and size of entities	11
3.2.2	Underlying investments	12
4	Method	13
4.1	Measuring relative performance.....	13
4.2	Controlling for systematic risk.....	13
4.2.1	Systematic risk at the portfolio level.....	14
4.2.2	Leverage risk at the entity level.....	15
5	Results	17
5.1	Empirical results	17
5.1.1	Different benchmarks	19
5.1.2	Sample selection issues	20
5.1.3	Robustness checks	20
5.2	Market risk over time	21
5.3	Gross-of-fees performance	21
5.4	Comparison with related literature	22
6	Conclusions	24
	References	25
	Appendix	28

1 Introduction

Private equity³ investing has grown tremendously since it started on an institutional scale in the 1970s. The industry's assets under management had increased to USD 3.8 trillion in June 2014, and the asset class continues to see strong inflow of capital with the Blackstone Group L.P. securing more than USD 17 billion in the biggest so-called "first close" of a buyout fund ever in May 2015 (Preqin, 2015; Banarjee and Chandler, 2015). There is a widely held belief of strong past performance and advocates of the industry argue that excess returns relative to similar investments are generated by a superior governance model of private equity (e.g., Jensen, 1986; Gottschalg and Groh, 2006; Lahr, 2010).

Researchers have thus far faced a tough challenge in evaluating these claims. Private equity is, as its name suggest, largely exempt from market prices. Due to the empirical difficulties in measuring the performance of non-listed private equity funds, findings range from positive (e.g., Robison and Sensoy, 2011; Higson and Stucke, 2012; Harris et al., 2014) to negative excess returns net of fees (e.g., Kaserer and Diller, 2009; Kaplan and Schoar, 2005; Phalippou and Gottschalg, 2009).

In this paper, we exploit the listed private equity (LPE) asset class to make a contribution to this performance puzzle. Although the market capitalization of the LPE universe surpassed USD 100 billion in 2014, academic research in this area remains in its infancy. From this diverse universe of LPE entities, we generate a sample of 17 entities that are listed equivalents of non-listed buyout⁴ funds, and measure their performance over the period 2007 to 2014 relative to similar public market investments.

Briefly, we adopt the following approach. We assign one benchmark index to each LPE entity in our sample and compare their total returns over time. Further, we control for systematic risk by leveraging the return of the benchmark indices, which are predominantly regional small cap indices. In estimating systematic risk, we specify the operating and leverage risk of each LPE entity. Operating risk is determined by more than 4,200 public market comparables of the 449 portfolio companies held by our sample, and leverage risk by the capital structure of the portfolio companies and the LPE entities themselves.

Our sample shows an average risk-adjusted underperformance or negative "alpha" of 2.4 percent per year relative to benchmark indices. We document a wide dispersion in performance, with the top quartile delivering excess returns to investors. Further, we estimate gross-of-fees performance to be slightly positive, suggesting that the average LPE entity adds value in investments. Beyond providing evidence of relative performance, we document several key characteristics of the LPE asset class, such as more diverse systematic risk and a cash drag on performance that non-listed funds pass on to investors.

Finally, and despite the small sample size and limited time period, our results correspond to those in recent literature on private equity performance, i.e. that the average private equity fund outperforms gross of fees and underperforms net of fees, and that relative performance improves when compared to broader stock markets instead of small cap indices (e.g., Phalippou, 2012).

³ Private equity in the context of this thesis is based on the relationship between an investor and an intermediary and defined as professionally managed equity investments in non-listed companies.

⁴ The reason for excluding LPE entities that pursue venture capital strategies from this study is twofold; it is difficult to find appropriate benchmark indices and peer group companies, and entities that pursue buyout-strategies are of higher interest as buyouts represent the bulk of total private equity assets under management.

2 Background and Related Literature

In this section, we provide an overview of the structure of private equity investing and discuss related literature on private equity performance.

2.1 Structure of private equity

The private equity asset class has grown steadily since its first boom in the 1980's and accelerated over the last decade, as illustrated in Figure 2.1 A. The largest and most mature private equity markets are the US and Western Europe. Most capital is managed by non-listed funds, structured as limited partnership funds with limited lives. Listed entities with a permanent capital base have increased in importance over the last decade, and are geared towards Europe partly because of legislation (Bilo et al., 2005; Lahr, 2010). Besides primary funds, there are non-listed and listed funds of funds that provide an investor with diversification, and listed firms that provide an investor the opportunity to participate in management fees (Lahr, 2010). Figure 2.1 B illustrates the overall market capitalization of listed entities.

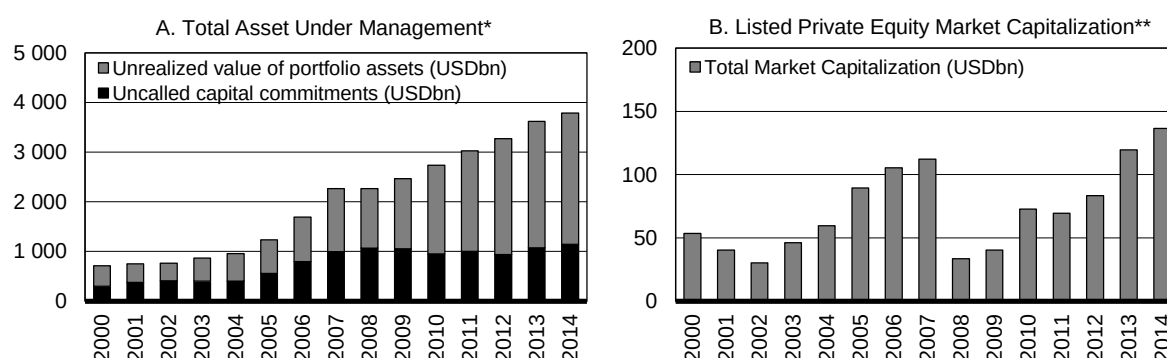


Figure 2.1 Private Equity Assets under Management

*Self-reported NAV of unrealized value **Market prices including discounts to NAV
Sources: Preqin (2015); LPEQ (2015)

2.1.1 Non-listed funds

2.1.1.1 Primary funds

The typical private equity fund is structured as a limited partnership fund with institutional investors, such as pension funds, sovereign wealth funds and endowments, as Limited Partners (the LPs) and a private equity firm as the General Partner (the GP). The limited partnership fund usually has a limited life of ten years, with an extension possibility of three years. At the closing of the fund, LPs commit to provide a certain amount of capital and the GP is responsible for identifying target companies, structuring the transactions, monitor and finally divest the investments. The GP calls capital from LPs to finance investments and distribute proceeds to LPs after divestments, and thus do not hold cash on average. Non-

listed funds report indicative net asset values (NAV) of their investments to investors (e.g., Kaplan and Strömberg, 2009; Phalippou and Gottschalg, 2009).

For its services, the GP charges a fixed management fee and a variable performance fee. The typical management fee is in the range 1.5-2.5 percent of committed capital during the investment period (year 1 to 5) and thereafter reduced to 2 percent or less of invested capital. The variable fee or carried interest is typically 20 percent of returns from realized investments over an 8 percent hurdle with committed capital as the base (e.g., Gompers and Lerner, 1999; Metrick and Yasuda, 2010).

2.1.1.2 Secondary funds

Besides primary funds, there are so called secondary funds that either acquire LP interests in primary funds or direct interests in portfolio companies from existing investors. The former is referred to as secondary funds of funds and is more common than the latter, which is referred to as secondary direct funds. The secondary market provides sellers liquidity and exit opportunities, while buyers can invest into identified portfolios, often at discounted prices (Peterman and Lai, 2009).

2.1.2 Listed entities

A listed private equity (LPE) entity is a listed entity that provides an investor the opportunity to participate directly or indirectly in private equity investments. The LPE asset class is more diverse than non-listed private equity. Practitioners such as LPX GmbH, the main LPE index provider, and LPEQ, a PR initiative of LPE entities, and a number of academics (e.g. Bilo et al., 2005, Bergmann et al, 2009) divide the LPE universe in direct LPE entities, indirect LPE entities (funds of funds), and firms. Lahr and Herschke (2009) further separate the direct category into externally managed funds and internally managed investment companies. Hereafter, we follow their classification.

2.1.2.1 Funds

Listed funds are the listed equivalents of non-listed funds, with the exception that they have a permanent capital base and are evergreen. Listed funds are externally managed and subject to fee structures similar to those of non-listed funds with the exception that fixed management fees are paid on invested capital as there are no undrawn capital commitments. Several listed funds are set up by managers of non-listed funds and invest alongside or through these funds. The evergreen nature of listed funds makes them reinvest proceeds from divestments. Listed funds are generally focused on growth, while some also distribute dividends or buy back shares. Typically, they report quarterly NAVs, calculated as the fair value of investments plus cash less liabilities, that are indicative but prepared according to strict guidelines by external audit firms (Lahr, 2010). Since the financial crisis, the majority of listed funds have traded at discounts to NAV in the range 10-30 percent (LPEQ, 2015).

2.1.2.2 Investment companies

Listed investment companies are similar to listed funds with the exception that they employ their own investment management. Thus, operating costs primarily show up as salaries instead of fees to an external investment manager. A number of investment companies publish NAVs. Compared to listed investment

companies that invest in public companies, these invest in private companies and are committed to a private equity business model, i.e. identifying target companies, structuring transactions, monitoring and finally divesting portfolio companies through IPOs, trade sales and secondary sales (Lahr, 2010).

2.1.2.3 Funds of funds

Listed funds of funds are secondary funds of funds that traded on stock markets. Thus, they provide an investor a liquid exposure to a diversified portfolio of non-listed funds (Bergmann et al., 2009).

2.1.2.4 Firms

Listed firms are listed managers of non-listed funds. They provide an investor an opportunity to participate indirectly in private equity investments through fixed management and variable performance fees (Lahr, 2010). In addition, a number of LPE entities that manage third-party capital but also invest proprietary capital in its funds. Thus, they provide exposure to both asset management and portfolio investments. These are hybrids between firms and investment companies (Lahr and Herschke, 2009).

2.2 Related literature on private equity

Advocates of private equity, particularly those adopting the free cash flow hypothesis, have argued that excess returns arise from a superior governance model of private equity, with active private investors, incentive schemes and focus on free cash flow growth (see e.g. Jensen 1986; Lahr 2010). In addition, they have argued that private equity investors can benefit from arbitrage between public and private market segments, and even information asymmetry. Critics have claimed that active managers and modifications to capital structures have little impact on long-term value, there are no arbitrage opportunities and it is possible to replicate private equity strategies with public market investments (see e.g. Rappaport, 1990; Groh and Gottschalg, 2006).

Researchers have thus far faced a tough challenge in evaluating these claims. Below, we discuss related literature on private equity performance. Key contributions are also summarized in Appendix A.

2.2.1 Non-listed funds

Due the empirical challenges associated with the lack of market prices, the current state of research gives no definite answer as to whether non-listed private equity funds generate positive or negative excess returns relative to public market investments. While most academics use the Public Market Equivalent method, described below, to measure performance, findings primarily diverge due to different choices of public market benchmarks, datasets with regard to time period and sources, and risk-adjustments.

2.2.1.1 Measurement techniques

The performance of non-listed funds is at its simplest expressed as IRRs net of fees. The IRR measure is widely used by practitioners. Benchmarking IRRs with the stock market performance over the same period of time neglects the timing of cash flows to investors. Further, average IRRs are typically upwards

biased as longer funds tend to perform worse.⁵ Therefore, recent literature relies on more sophisticated approaches, of which the Public Market Equivalent is the most widely used method (see the literature overview in Appendix A).

A Public Market Equivalent (PME), which is referred to as Profitability Index (PI) in part of the literature, is the ratio of the present value of cash proceeds from divestments divided by the present value of cash invested in portfolio companies from the perspective of a non-listed fund. The discount rate is the realized return of public market investments, such as the S&P500 Index. A PME above one indicates outperformance of the fund relative to the public market.

If the returns of the non-listed fund have a beta greater (less) than one, the basic PME will overstate (understate) relative performance. Therefore, academics that do control for systematic risk try to estimate equity betas by matching industry-specific betas and/or assuming or calculating leverage.

2.2.1.2 Empirical evidence

Although private equity had its first boom in the 1980s, it took until 2005 for the first large scale academic contributions to emerge (Lerner, 1997; Kaplan and Schoar, 2005). Using different versions of the same dataset obtained from Thomson Venture Economics (TVE), which records data on private equity worldwide, Kaplan and Schoar (2005), Kaserer and Diller (2009) and Phalippou and Gottschalg (2009) find that the average buyout fund had underperformed public markets.

Kaplan and Schoar (2005) study 746 US funds (thereof 169 buyout funds) raised over the period 1980 to 2001, obtained from TVE. They find a PME of 0.96 relative to the S&P500 for the average buyout fund, and document substantial heterogeneity. The standard deviation in PMEs is 0.52. Given the fee structure, they estimate that the average buyout fund outperforms the S&P500 gross of fees.

Kaserer and Diller (2009) study 739 European funds (thereof 321 buyout funds) raised over the period 1980 to 2003, also obtained from TVE. They find a PI of 0.94 relative to the MSCI Europe for the average buyout fund.

Phalippou and Gottschalg (2009) study 1,328 US and European funds (thereof 314 buyout funds) raised between 1980 and 1993, also obtained from TVE. They find an average PME of 0.88 relative to the S&P500 for the overall sample, which they translate to underperformance of 3 percent per year net of fees. Phalippou and Gottschalg also control for systematic risk by assuming a declining debt-to-asset ratio from an LBO average of 0.75 at entry to industry-average levels for each portfolio company. It deteriorates performance further to a PME of 0.75, corresponding to 6 percent per year below the S&P500. They document a considerable variation across funds, with the third quartile delivering excess returns, and find that European buyout funds on average underperform US buyout funds, similar to Hege et al. (2006). Further, they estimate fees to amount to 6 percent per year over the life of a fund, primarily deriving from the fixed management fee on committed capital. Thus, gross-of-fees risk-adjusted performance was in line with the S&P500.

⁵ Phalippou and Gottschalg (2009) find a negative correlation between fund performance and fund length, which translates into an upwards bias. The average IRR in their sample of 1,328 buyout funds from 1980 to 2003 is reduced from 14.64% to 12.22% when they correct for the bias by weighting each IRR by the product of the duration and the present value of investment.

Another of the earlier contributions was Ljungqvist and Richardson (2003). Although their findings are believed to be overstated due to a disproportionate number of large, US-focused and experienced buyout funds, and data obtained from one single LP which introduces additional uncertainties (Lerner et al., 2007; Phalippou and Gottschalg, 2009), they merit comments.

Ljungqvist and Richardson study 73 primarily US funds (thereof 54 buyout funds) of vintages from 1981 to 2001. They find an average PME of 1.12 relative to the S&P500 for buyout funds when adjusting for industry but not leverage risk. They control for industry risk by assigning portfolio companies to one of the 48 broad industry groups of Fama and French (1997) and thus calculating a weighted portfolio beta of each fund. The average beta, assuming industry-average leverage, was 1.08 for buyout funds, with a standard deviation of 0.11.

Above findings have come into question in recent years as three major studies, which made use of proprietary databases, found outperformance of the average US buyout fund.

Robinson and Sensoy (2011) study a sample of 837 primarily US funds (thereof 542 buyout funds) raised over the period 1984 to 2009, obtained from one large LP. They find a PME of 1.18 for the average buyout fund relative the S&P500 with systematic risk of unity, and 1.12 when assuming a beta of 1.5, which reflects the high-end of leverage levels of buyouts.

Higson and Stucke (2012) study a sample of 1,169 US buyout funds raised over the period 1980 to 2008, obtained primarily from Cambridge Associates, one of the largest LP advisors. Their sample include funds with combined committed capital in excess of USD 1 trillion, representing over 85% of funds ever raised in the US. They find average outperformance relative the S&P500 by 5 percent per year and document significant cross-sectional variation. Further, they observe a downward sloping trend in returns over time, and cyclicity across vintages. The outperformance deteriorates to 1.8 percent per year when fund returns are compared the S&P600 Index, comprising US small cap stocks.

Harris et al. (2014) study a sample of 1,200 US funds (thereof 598 buyout funds) raised over the period 1984 to 2008, obtained from Burgiss, a provider of performance monitor tools for over 200 LPs. They find a PME of 1.20 for the average buyout fund relative to the S&P500 with market risk of unity. Results do not change by more than 0.02 for beta assumptions of 1.5 and 2.0, respectively, and measurement relative to the Russel2000 Index, excluding the largest US stocks.

Gottschalg et al. (2013) study 20 UK buyout funds raised over the period 1988 to 2001. They investigate whether it is possible to replicate PE performance with public market securities, and find outperformance of the buyout funds for all mimicking strategies. Performance deteriorates as they adjust for industry and leverage risk, but the buyout funds still enjoy an 11.5% spread.

As response to the three large-scale US studies, Phalippou (2012a) and Phalippou (2012b) revisited the performance of buyouts. He points out that buyout funds invest in companies that of small-cap sizes in public market terms, and that comparisons with the S&P500 overstates performance of buyout funds as it, in contrast to historically, has underperformed small cap indices over the last decade. On a sample of 392 US buyout funds, Phalippou (2012b) finds outperformance relative to the S&P500 and underperformance of by 3.1 percent per year relative to levered small cap indices.

2.2.2 Listed entities

While non-listed funds have received considerable academic interest, only a handful of contributions investigate the area of listed private equity. Bilo et al. (2005) find higher Sharpe ratios for a sample of venture- and buyout-focused LPE entities in the period 1986-2000 compared to the MSCI World, and Leung (2013) find a CAPM beta of 1.30 for the LPX50 Index, comprising the 50 largest and most liquid LPE entities of all organizational forms, during 1994 to 2008. Leung also finds that LPE entities exhibit a positive size premium and negative value premium, and thus resemble small-cap and growth stocks. Lahr and Herschke (2009) and Lahr (2010) represent the most notable contributions in the area.

Lahr and Herschke (2009) investigate risk and return characteristics of LPE entities over the period 1986 to 2008 according to their organizational form. The overall sample yields an annual spread-adjusted but insignificant alpha of 2.9 percent. For investment companies and funds they find insignificant alphas of -0.3 percent and 3.5 percent. Further, they document differences in systematic risk. The average beta is 1.4 for investment companies, 1.4 for firms, 1.0 for funds and 0.7 for funds of funds. They are unable to unlever betas properly as they cannot identify leverage accumulated in portfolio companies, but conclude that firms' exhibit higher systematic risk as they also generate income from fees and carried interest.

Lahr (2010) further investigates the time-varying risk of LPE entities. He finds that systematic risk of the overall sample varies over time, and that individual betas are highly unstable over time.

Huss and Zimmermann (2012) apply the PME method, and discount cash flows of 416 non-listed private equity funds from 1986 to 2003 with the realized returns of the LPX50 Index, comprising the 50 largest and most liquid LPE entities, the MSCI World, and the S&P500. They find average PMEs of 1.02, 1.16 and 1.17, respectively. The PME of 1.02 relative to the LPX 50 shows almost no performance difference between non-listed funds and LPE entities over time. Thus, returns of listed private equity appear to be a good proxy for non-listed returns.

3 Sample and Data

In this section, we describe the sample generation and present descriptive statistics of our final sample and its validity, i.e. resemblance to non-listed buyout funds.

3.1 Sample generation

The purpose of our sample generation is to arrive at a sample comprising the listed equivalents of non-listed funds pursuing buyout strategies. We arrive at our final sample by first narrowing the LPE universe and then impose restrictions regarding the required level of detail.

First, we narrow the LPE universe that we obtain from LPX GmbH, which is the best known provider of LPE indices (Lahr, 2010). Its public database of LPE entities worldwide is the basis for the LPX family of LPE indices, ranging from global indices such as the LPX50 to style indices such as the LPX venture.⁶ From a total of 59 currently and previously listed funds and investment companies, according to the classification laid out above, we exclude venture-focused entities (43 remaining), and hybrids that earn income also on management activities and, as shown by Lahr and Herschke (2009), thus exhibit different systematic risk (32 remaining). We refer to these 32 LPE entities as our initial sample or researchable universe. Its constituents and market capitalization over time are displayed in Appendix B.

Second, we impose restrictions regarding the level of detail required, as described in the Method section, and the number of years to enable a measurement of performance over time. These restrictions narrow our initial sample to a final sample of 17 LPE entities. The primary reasons for LPE entities to be excluded were insufficient disclosures by LPE entities or inaccessibility to data, typically in emerging markets. Only two out of five that have delisted or entered a realization phase i.e. divesting the investment portfolio in a timely manner and distributing proceeds to shareholders, were excluded. Because of poor historical transparency in financial reporting and new listings, we narrowed our measurement periods to fall within the time period 2007-2014.

Table 3.1 Sample Generation

The constituents of the initial sample are displayed in Appendix B, and the constituents of the final sample are described in Appendix C.

Samples		Number of LPE Entities
Initial Sample	Funds and investment companies	59
	Non-venture funds and investment companies	43
	Non-venture funds and investment companies, ex-hybrids	32
Final Sample	Non-venture funds and investment companies, ex-hybrids with required level of data	17

⁶ To be eligible for inclusion in the LPX database, LPE entities must hold 50% of net assets in private companies and meet a set of liquidity constraints; a maximum bid-ask spread of 1.5-4.0%, and a minimum market capitalization of USD 20-150 million, a minimum trading volume of 0.06-0.10% of market capitalization depending on the index.

3.2 Sample descriptives and validity of data

Our sample contains 17 LPE entities, for which we measure performance over 6.4 years on average. The majority invests in Western Europe (13), with five dedicated to the UK market. The other entities invest in South East Asia, China, Russia and South Africa, respectively. Most of the LPE entities are listed on the London Stock Exchange (7). The key characteristics of the sample are summarized in Table 3.2.

Table 3.2 Sample Descriptives

	Mean	Std. Dev	First Quartile	Median	Third Quartile
LPE Entities					
Market Capitalization, EURm	841	1,252	81	249	612
Premium to NAV, %	-26%	25%	-42%	-28%	-16%
Investment Portfolios					
Number of Portfolio Companies	13	8	9	10	8
Number of Investments/Year	1.8	1.5	0.7	1.5	2.7
Number of Divestments/Year	2.0	1.5	1.0	1.9	2.8
Enterprise Value of Portfolio Companies, EURm	1,474	3,389	71	278	1,182
Equity Share in Portfolio Companies, %	34%	20%	23%	32%	45%

3.2.1 Structure and size of entities

Our sample contains six investment companies and 11 funds, of which six invest alongside or through non-listed funds by its investment manager. For example, HgCapital Trust is the listed investment vehicle of HgCapital, a UK midmarket private equity firm. The other five funds are the sole investment entity managed by investment manager. The funds charge fixed management fees in the range 1.5-2.2 percent of the fair value of investments and variable performance fees of 10-20 percent of realized returns exceeding a hurdle of 7-8 percent. While the funds share the same structure as non-listed funds, investment companies such as Ratios AB, a Swedish private equity firm, employ their own investment management. However, they are committed to a private equity model, as described in 2.1.2.4.

Half of the LPE entities in our sample have average market capitalizations in the range EUR 81-612 million, while Eurazeo SA, Wendel SA and Ratios AB have average market capitalization in excess of EUR 2 billion. Market capitalizations over time are available in Appendix B. The sample trades at an average and median discount to NAV of 28 and 32 percent, respectively, during the measurement period. Thus, NAVs were on average higher than market capitalizations. Kaserer and Diller (2009) studied a sample of 321 European buyout funds over the period 1980 to 2003 and documented an average fund size at closing of EUR 320m. While the fund size at closing represents capital commitments, NAVs of LPE entities reflect a mixture of new and mature investments. Accordingly, our sample comprises smaller entities than the average buyout fund, but also a couple of significantly larger investment companies that pursue private equity strategies.

The market capitalization of our sample represents 20 percent of the total market capitalization of the LPE universe (see Figure 2.1 B) over the period 2007 to 2014, and 76 percent of the initial sample.

3.2.2 Underlying investments

Although we have not deliberately limited our sample to Europe, the regional distribution of investments made by LPE entities in our sample bears strong resemblance to European buyout transactions. Achleitner et al. (2010) study a sample of 206 buyout transactions completed in Europe over the period 1991-2005 by 27 firms in 20 different countries, with the top five being the UK (44%), France (17%), Sweden (10%), Germany (6%), and the Netherlands (3%). The 17 LPE entities in our sample held 449 portfolio companies in 29 different countries, with the top five being the UK (38%), France (23%), Sweden (15%), Spain (7%), and Germany (4%). Figure 3.1 illustrates the similarities.

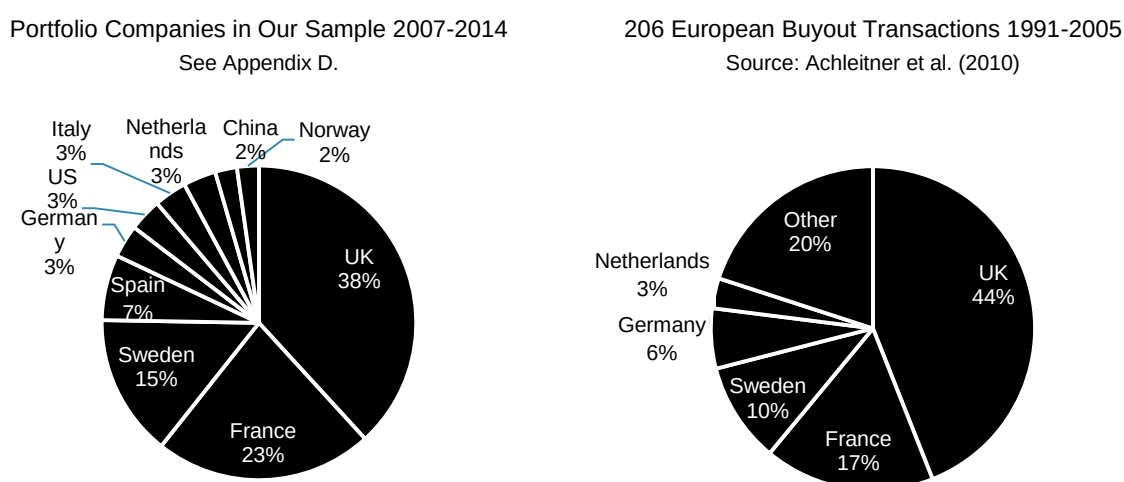


Figure 3.1 Distribution of Portfolio Companies

Comment: The sample distribution in Achleitner et al. (2010) corresponds to data from EVCA

In terms of sectors, portfolios are diversified with most investments in the manufacturing and information services sectors (see Appendix D). On average, our sample holds 13 portfolio companies and makes around 2 investments and divestments annually during the measurement period. Thus, portfolios are balance in terms of vintages. This can be compared with average number of portfolio companies of 16 and 20 for US and UK buyouts, as documented by Richardsson and Ljungqvist (2003) and Gottschalg et al. (2013). In terms of deal sizes, averages values are again driven by Eurazeo SA and Wendel. However, the median self-reported enterprise value is EUR 278 million, which is similar to the average enterprise value at entry of EUR 283 for European buyout funds (Achleitner et al., 2010).

While an average equity interest of 34 percent seems low for our sample, it has a technical explanation. For those funds that invest alongside or through other funds managed by its investment manager, the combined equity interest is typically a majority stake. For example, Apax Partners LPP holds a combined share of 56 percent in Capio, the Swedish healthcare group, through its non-listed funds and Altamir, its listed investment vehicle that is included in our sample and only holds 5 percent.

Appendix C presents facts about the LPE entities in our sample, and Appendix D and E displays the sector and country exposure of our sample, respectively.

4 Method

The handful of contributions on LPE performance make use of available time series and measures Jensen alphas by regressing returns of diverse samples against broad stock markets (e.g., Lahr and Herschke, 2009). The purpose of this study is to measure the performance of LPE entities that are listed equivalents of traditional non-listed buyout funds relative to similar public market investments. Therefore, we measure returns relative to individual benchmark indices and control for risk by estimating systematic risk from its underlying investments, according to the following formula:

$$\alpha = [1 + (r_{LPE} - \bar{\beta} * r_i)]^{(1/T)} - 1 \quad (1)$$

where α represents the annualized risk-adjusted excess return of an LPE entity over a measurement period of T number of years, r_{LPE} represents the cumulative total return of an LPE entity, and r_i represents the cumulative total returns of a benchmark index that resembles the LPE entity's portfolio companies. In addition, $\bar{\beta}$ is a measure of the average systematic risk of the LPE entity during the measurement period. Below, we describe the choice of benchmark indices and outline our approach for measuring systematic risk.

While the underlying investments of our sample resemble those of non-listed funds, what we measure is different compared to literature on non-listed funds. Most existing studies measure performance of mature funds. For example, Phalippou and Gottschalg (2009) only included funds raised prior to 1993 in order to minimize errors from residual NAVs and capture only realized performance. LPE returns, on the other hand, reflect both realized returns and changes in expectations of unrealized returns on existing and even future investments. However, and similar to any public company, realized returns and returns to shareholder should follow each other over time (e.g., Goedhart et al., 2010).

4.1 Measuring relative performance

As discussed, literature on non-listed funds increasingly measure excess returns relative to small cap indices, which better resemble the size of portfolio companies (e.g. Phalippou, 2012b; Higson and Stucke, 2012). We follow this argument and enhance the approach further by assigning one benchmark index to each LPE entity in our sample. In assigning benchmark indices, we select indices that resemble the geographic footprint and size of portfolio companies. Most benchmark indices are regional small cap indices, such as the MSCI Nordic Small Cap Index for Ratios AB, the Swedish private equity conglomerate. The indices are displayed by LPE entity in Table 5.2 in the Results section.

4.2 Controlling for systematic risk

Another dimension to control for is differences in systematic risk. We control for systematic risk by comparing the LPE returns of our sample with those of a hypothetical investor that has levered up his position in the benchmark indices.⁷

⁷ This comparison neglects the cost of leveraging up the position in the benchmark index.

One way to estimate betas of LPE entities is to calculate the actual raw betas. However, actual betas of LPE entities may be driven by sentiment or liquidity, and are shown to be highly unstable over time (Lahr and Herschke, 2009; Lahr 2010). While the beta of a public company is typically best estimated by calculating an unlevered industry beta and lever it based on the company's capital structure, measuring an unlevered industry beta of non-operating LPE entities is inappropriate. Private equity is an ownership form and not a sector with a specific systematic risk. The risk of any private equity entity is given by its portfolio investments. Therefore, we first estimate the systematic risk of the investment portfolios similar to studies of non-listed funds, and then control for additional leverage or cash at the entity level, which is distinctive for evergreen LPE entities.

4.2.1 Systematic risk at the portfolio level

We first estimate the systematic risk of each portfolio company and calculate the weighted average for every year during the measurement period. This is the equivalent of a portfolio beta in Ljungqvist and Richardson (2003), and defined in formula (2):

$$\beta_t^p = \frac{\sum_{n=1}^N FV_n \left(\beta_{n,t}^u \left[1 + \frac{ND_{n,t}}{E_{n,t}} \right] \right)}{\sum_{n=1}^N FV_{n,t}} \quad (2)$$

where $\beta_{n,t}^u$ represents the operating systematic risk (unlevered beta) of a portfolio company, $ND_{n,t}$ represents the net debt⁸ of a portfolio company, and $E_{n,t}$ is a measure of the market value of equity of a portfolio company, according to self-reported fair value. Further, $FV_{n,t}$ represents the self-reported fair value of the stake held in a portfolio company⁹, and β_t^p represents the portfolio beta, calculated as the weighted levered risk of N portfolio companies.

The unlevered betas are estimated by calculating the median¹⁰ unlevered beta of listed peer group companies for each portfolio company. A peer group is defined by the six-digit NAICS industry code that we assign to each portfolio company. We decided that for a peer group to be meaningful, it has to consist of at least 10 companies with market capitalizations in excess of EUR 50 million to exclude the least liquid shares (in those cases we find fewer than 10 companies or more than 50 companies, we broadened the NAICS code or narrowed the geography, respectively). In total, we specify 187 peer groups and incorporate more than 4,200 peer group companies in our analysis. We calculate unlevered betas of peer group companies by first calculating actual levered betas using monthly returns from January 2009 to

⁸ In most cases, we use net debt data disclosed by the LPE entities, either per portfolio company or on aggregated portfolio level. Otherwise, we obtained total debt and cash data from Orbis, the global company database. Only years for which we found consolidated accounts, including acquisition vehicles used in LBOs, for portfolio companies representing more than 70% of the total self-reported fair value were included. Then, we assumed similar leverage for the unknown part of the portfolio.

⁹ For Ratos AB and Bure AB that do not disclose fair values, we weight systematic operating risk of portfolio companies according to invested capital, and use market capitalization less leverage in the parent company as a proxy for fair value of portfolio investments. The former overstates new investments if values on average increase, and the latter overstates leverage compared to other LPE entities if there is a discount to unobservable NAV.

¹⁰ Using the median mitigates the effect of outliers within peer groups, see e.g. Goedhart et al. (2010).

December 2014 with the MSCI World Index as the market portfolio, and then unlever these betas with their average net debt-to-market capitalization (of straight and preferred equity).¹¹

With these unlevered industry betas for portfolio companies, we lever these with leverage in portfolio companies according to Formula (2).¹² Here, we assume risky tax shields because of the high leverage levels in our sample, as shown later, which leads to a risk that portfolio companies do not generate sufficient income to make use of potential tax shields. Further, we set the debt to zero, i.e. assuming risk-free debt. We perform a robustness check and relax these assumptions in the Results section.

4.2.2 Leverage risk at the entity level

While GPs call and distribute capital from and to LPs in connection to investments and divestments, the evergreen nature of LPE entities make them generally to hold cash positions. However, LPE entities can also be leveraged. The latter is a relevant alternative for LPE entities as equity issues are typically costly for its ordinary shareholder, due to discounts to NAV. We lever (unlever) the portfolio betas β_t^p calculated above with additional leverage (net cash positions) using Formula (4):

$$\beta_t^e = \beta_t^p \left(1 + \frac{ND_t}{E_t} \right) \quad (3)$$

where ND_t represents the market value of net debt¹³ at the entity level, E_t represents the market capitalization of straight equity (we adopt the perspective of an ordinary shareholders and thus treat preferred equity as debt equivalent). Further, β_t^e represents the systematic risk borne by equity investors in the LPE entity, which we refer to as the entity beta. In Formula (3), we make two assumptions.

First, we continue to assume risky tax shields of debt for the reasons laid out above, and due to tax reliefs for UK Investment Trusts, which represents a large share of our sample (Lahr, 2010). Again, we perform a robustness check in the Results section. Second, we assume that there is no other source of systematic risk for LPE entities besides that of portfolio investments. This assumption is appropriate as our sample generation processes excluded hybrid entities that earn income also from fees and carried interests, and thus exhibit a systematic risk not solely from investments.

With knowledge of entity betas over the measurement period, we calculate the average entity beta as our measure for systematic risk of an LPE entity, displayed in Formula (1).

¹¹ In unlevering the actual levered betas of peer group companies, we assume that nominal value of debt equals market value debt (see a similar approach in Groh and Gottschalg, 2006). Further, we assume that tax benefits of debt are certain as the degrees of leverage should be moderate for listed peer group companies (e.g., Groh and Gottschalg, 2006), a marginal tax rate of 35% (see similar approaches for European and US buyouts in Achleitner et al 2010 and Phalippou and Gottschalg, 2007), and a debt beta of zero (e.g., Goedhart et al., 2010; Thorsell, 2008). All calculations used data obtained from Bloomberg.

¹² The equity risk of banks and institutions was estimated by calculating the median levered beta of a peer group of financial institutions in their respective regulatory environments, as proposed by Damodaran (2009).

¹³ Again, we assume that nominal value of debt equals market value debt (see e.g., Groh and Gottschalg, 2006).

Three final remarks with regard to beta estimation; first, we assume a constant systematic operating risk of portfolio companies, which merits discussion as efforts are usually made within PE-owned companies to reduce operating risk.¹⁴ However, we are unable to assess how such activities influence operating risk in individual portfolio companies. Accordingly, the weighted unlevered beta or systematic operating risk of LPE entities changes only because of revaluations or investments/divestments.

Further, it could also be argued, in line with Kaplan (1989), that the tax benefits of debt are important in private equity investments, and that managers of LPE entities thus ensure that they are likely to receive them. In addition, a few LPE entities in our sample, e.g. Bure AB, are conservative with regards to debt. Again, we consider a relaxation of the assumption of risky tax shields in the Results section.

Finally, and with regard to the reliability of our beta estimation, some LPE entities hold investments that we cannot properly identify, such as non-transparent funds. In estimating portfolio betas according to Formula (2), we decided that for an estimation to be representative, portfolio companies had to represent at least 70 percent of the fair value of the investment portfolio. Another aspect is that of self-reported fair values and net debt data, we use self-reported fair values of investments as a proxy for market value, and obtain net debt data from LPE entities and the Orbis company database, implying that net debt definition could vary across the sample. While measurement errors may exist across the sample, the impact should be minor for individual LPE entities and not material for the overall sample.

¹⁴ See e.g. Groh and Gottschalg (2006) and Wiersema and Liebeskind (1995) for evidence on PE-owned companies focusing on safer and core operations, and Bergström et al. (2007) for evidence on operational improvements.

5 Results

5.1 Empirical results

The risk-adjusted excess return of our sample is displayed in Panel A in Table 5.1. On average, our sample yielded a negative risk-adjusted excess return or negative “alpha” of 2.4 percent per year relative to benchmark indices. The median LPE entity underperformed by 4.6 percent per year. Thus, a hypothetical investor in a levered benchmark would have been better off than an investor in an LPE entity. Cross-sectional variation is large, with the first quartile underperforming by 12.7 percent per year and the third quartile outperforming by 3.6 percent per year. Results by LPE entity are displayed in Table 5.2.

A remarkable feature of our results is systematic risk and the role of risk-adjustment. While the absolute effects are small given that the markets have done sideways, the direction is notable. Excess returns improve when we adjust for systematic risk, on average by one percentage point. However, the effects are diverse with some LPE entities experiencing deterioration in excess returns when we control for systematic risk. In literature on non-listed private equity funds, on the other hand, performance largely deteriorates when leverage risk of portfolio investments is taken into consideration.

Table 5.1 Results, Overall Sample

Returns refer to annualized returns in EUR over the measurement period. Average values refer to equally-weighted averages. Excess returns are calculated from the difference in cumulate performance between LPE entities and their leveraged benchmark indices, according to Formula (1).

	Mean	Std. Dev	First Quartile	Median	Third Quartile
Panel A. Returns, Annualized					
Sample	2.0%	16.7%	-4.7%	0.8%	9.5%
Benchmark Index	4.9%	8.1%	1.7%	4.6%	6.3%
Leveraged Benchmark Index	4.1%	8.4%	1.6%	5.6%	8.6%
<i>Excess Return, No Risk-Adjustment</i>	<i>-3.4%</i>	<i>14.1%</i>	<i>-8.4%</i>	<i>-6.8%</i>	<i>-1.8%</i>
<i>Risk-Adjusted Excess Return</i>	<i>-2.4%</i>	<i>14.3%</i>	<i>-12.7%</i>	<i>-4.6%</i>	<i>3.6%</i>
Panel B. Risk Characteristics, Average					
Unlevered Portfolio Beta	0.83	0.10	0.75	0.84	0.89
Portfolio Beta	1.26	0.22	1.13	1.31	1.41
Entity Beta	1.13	0.56	0.74	1.06	1.38
Leverage in Portfolio Companies	0.5x	0.4x	0.3x	0.6x	0.7x
Leverage at the Entity Level	-0.2x	0.4x	-0.4x	-0.2x	0.0x
Combined Leverage	0.3x	0.7x	-0.2x	0.2x	0.5x

To understand the risk-adjustment, we investigate the components of systematic risk, displayed in Panel B in Table 5.1. Investors in LPE entities were exposed to higher risk than the market, expressed as average and median entity betas of 1.13 and 1.06, respectively. However, the standard deviation is 0.56 and eight out of our 17 LPE entities had entity betas below one, which improves risk-adjusted returns in times of

Table 5.2 Results, Individual LPE Entities

Returns refer to annualized returns in EUR over the measurement period. Average values refer to equally-weighted averages. Excess returns are calculated from the difference in cumulate performance between LPE entities and their leveraged benchmark indices, according to Formula (1).

Panel A. Average Leverage and Equity Beta										Panel B. Annualized Returns				
Organizational Form*	Time Period	Years	Leverage in Portfolio Companies	Leverage at the Entity Level	Combined Leverage	Unlevered Portfolio Beta	Portfolio Beta	Entity Beta	Actual Raw Beta**	Return	Benchmark Index*** Return	Leveraged Benchmark Index Return	Excess Return, No Risk-Adjustment	Risk-Adjusted Excess Return
Altamir	F	2008-14	7	0.8x	-0.2x	0.5x	0.75	1.32	1.12	1.68	4%	6%	7%	-5%
ARC Capital Holdings	F†	2011-13	3	0.0x	-0.4x	-0.3x	0.89	0.92	0.58	1.02	-20%	-4%	-2%	-17%
Aurora Russia Limited	F†	2008-14	7	0.0x	-0.8x	-0.8x	0.85	1.31	1.26	2.01	-29%	-14%	-23%	-1%
Brait S.A.	I	2012-14	3	0.2x	0.0x	0.2x	0.91	1.05	1.06	1.32	45%	8%	9%	40%
Bure Equity AB	I	2007-14	8	0.0x	-0.2x	-0.2x	0.89	0.92	0.76	0.88	10%	4%	3%	7%
Candover Investments plc	F†	2007-14	8	0.9x	0.5x	1.8x	0.75	1.47	2.31	3.13	-18%	5%	9%	-23%
Dinamia Capital Privado, S.C.R., S.A.	F	2007-14	8	0.8x	-0.4x	-0.1x	0.78	1.37	0.74	1.22	-5%	2%	1%	-7%
Dunedin Enterprise Investment Trust PLC	F	2008-14	7	0.6x	-0.6x	-0.4x	0.79	1.26	0.58	0.95	1%	6%	4%	-4%
Electra Private Equity PLC	F	2008-14	7	0.7x	-0.1x	0.4x	0.84	1.43	1.16	1.15	9%	6%	7%	4%
Eurazeo S.A.	I	2007-14	8	1.4x	-0.1x	1.2x	0.71	1.70	1.49	1.76	-1%	5%	6%	-14%
HgCapital Trust plc	F	2009-14	6	0.6x	-0.3x	0.1x	0.85	1.35	0.86	0.66	15%	21%	19%	-13%
Northern Investors Company PLC	F†	2007-14	7	0.6x	-0.1x	0.3x	0.72	1.13	0.95	0.88	9%	2%	2%	8%
OFI Private Equity Capital SCA	F	2008-10	3	0.6x	0.3x	1.0x	0.77	1.22	1.49	n/a	-9%	0%	-1%	-8%
Ratos AB	I	2007-14	8	0.5x	0.0x	0.4x	0.97	1.41	1.38	1.35	-2%	4%	6%	-14%
Symphony International Holdings Limited	F	2010-14	5	0.3x	-0.3x	-0.1x	0.66	0.90	0.60	1.22	9%	13%	9%	1%
TVC Holdings	I†	2010-13	4	0.4x	-0.7x	-0.6x	0.97	1.42	0.44	0.91	17%	18%	9%	10%
Wendel S.A.	I	2007-14	8	0.3x	0.9x	1.5x	0.96	1.25	2.39	2.27	0%	2%	4%	-5%
Mean			6.3	0.5x	-0.2x	0.3x	0.83	1.26	1.13	1.40	2%	5%	4%	-2%
Standard Deviation				0.4x	0.4x	0.7x	0.10	0.22	0.56	0.64	17%	8%	8%	14%
First Quartile				0.3x	-0.4x	-0.2x	0.75	1.13	0.74	0.94	-5%	2%	2%	-13%
Median				0.6x	-0.2x	0.2x	0.84	1.31	1.06	1.22	1%	5%	6%	-5%
Third Quartile				0.7x	0.0x	0.5x	0.89	1.41	1.38	1.70	9%	6%	9%	4%

*F = funds, I = investment companies, † = delisted or in realization phase, **Actual raw betas calculated from monthly return data from 2007 to 2014 with the MSCI World Index as market portfolio (data obtained from Bloomberg); *** Benchmark indices: *Altamir* = MSCI Europe Small Cap, *ARC Capital Holdings* = MSCI China Small Cap, *Aurora Russia Limited* = RTS2, *Brait S.A.* = MSCI South Africa, *Bure Equity AB* = MSCI Nordic Small Cap, *Candover Investments plc* = MSCI Europe Small Cap, *Dinamia Capital privado, S.C.R., S.A.* = MSCI Spain, *Dunedin Enterprise Investment Trust PLC* = MSCI UK Small Cap, *Electra Private Equity PLC* = MSCI UK Small Cap, *Eurazeo S.A.* = MSCI Europe Small Cap, *HgCapital Trust plc* = MSCI Europe Small Cap; *Northern Investors Company PLC* = MSCI Europe Small Cap, *OFI Private Equity Capital SCA* = MSCI France Small Cap, *Ratos AB* = MSCI Nordic Small Cap, *Symphony International Holdings Limited* = MSCI South East Asia, *TVC Holdings* = MSCI UK Small Cap, and *Wendel S.A.* = MSCI Europe Mid Cap

rising public markets¹⁵. The positive effect from these entities is larger than the negative effect from LPE entities with betas above one, and explains the effect of risk-adjustment on our overall sample.

As displayed in Panel B in Table 5.1, the distribution of systematic operating risk or unlevered betas is tight across LPE entities, with a standard deviation of 0.10. Thus, leverage must be the primary source of differences in systematic risk. Our sample shows average leverage in portfolio companies of 0.5x and average portfolio betas of 1.22. Again, the distribution is fairly tight across LPE entities, with portfolio betas slightly below one only for three entities that employ little or no debt to finance investments. Instead, the source of different systematic risk is found in leverage at the entity level. Five entities hold net cash positions at the entity level to that extent that expected returns fall below the market. Net cash at the entity level characterizes our sample. Only three LPE entities are leveraged at the entity level, and our sample on average holds net cash amounting to 20 percent of market capitalization. This is a distinguishing feature compared to non-listed funds. LPE entities are evergreen and reinvest proceeds from realizations, while GPs of non-listed funds call and distribute capital from and to LPs in connection to investments and divestments. In addition, LPE entities structured as funds may also hold cash because of undrawn capital commitments to funds managed by its investment manager. Thus, the returns of LPE entities are subject to cash drag that the non-listed funds pass on to investors and excludes from IRRs, and NAV growth and stock returns of LPE entities are not comparable with IRRs of non-listed funds. If LPs are not superior in managing cash, it could be argued that LPE returns better reflect the true performance of private equity investing, as it by nature requires managing of infrequent cash flows.

Average leverage in portfolio companies of 0.5x is substantially higher than average leverage of 0.2x for peer group companies, for which we unlevered industry betas and thus are directly comparable as they reflect the industries and the time period of our sample. The higher leverage level supports our base-case assumption of risky tax shields.

A major remark on systematic risk; while the entity betas we estimate show large variation, they correspond well to the actual raw betas of their shares. The correlation is 0.88.¹⁶ Thus, the systematic risk implied by stock prices seems to properly reflect the weighted risk of individual portfolio investments. Estimated entity betas and actual raw betas are displayed by LPE entity in Table 5.2.

5.1.1 Different benchmarks

Our results show underperformance relative to small cap indices. Recent literature has pointed out that private equity performance should be compared to small cap indices, as deal sizes of buyouts typically fall within their size ranges, and that performance is overstated when compared to larger indices, which are predominantly used in previous literature. We show how our results change if we compare performance relative to the MSCI Europe Index. The MSCI Europe is the most relevant large index for our overall sample, which includes only four non-European entities. Further, it was the benchmark for European buyout funds in Kaserer and Diller (2009). We make two observations.

¹⁵ Among the LPE entities with entity betas below one, benchmark indices rose during the measurement period for all except ARC Capital Holdings, as the MSCI China Index lost in value.

¹⁶ Actual raw betas of the LPE entities were calculated from monthly returns during 2007-14, which reflects our measurement period, with the MSCI World Index as the market portfolio.

First, the overall results improve. On average, the risk-adjusted excess return improves from -2.4 percent to -1.9 percent per year, and the median from -4.6 percent to -2.2 percent. Evidently, the MSCI Europe has behaved differently than individual benchmark indices, which is plausible as its average constituent has a market capitalization of USD 20 billion. Second, some LPE entities are mistreated. For example, Aurora Russia Limited fell dramatically, but in line with the RTS2 Index, from 2008 to 2014.¹⁷ Compared to the MSCI Europe, Aurora's slight underperformance relative to the RTS2 is turned into double-digit negative excess returns per year.

5.1.2 Sample selection issues

The availability of data translated into a final sample of 17 entities from 2007 to 2014, a time period including the financial crisis. Although we calculate relative returns, this turbulent period in which discounts to NAV of LPE entities widened to 70 percent merits further analysis.¹⁸ As share prices and discounts to NAV of LPE entities bottomed out in 2009, we measure post-crisis performance from 2010 to 2014. This reduces our sample size from 17 to 16 entities and the average measurement period from 6.4 years to 4.6 years. Results do not improve. The average risk-adjusted excess return deteriorates further from -2.4 percent to -5.0 percent per year, while the median reduces underperformance -4.6 percent to -1.5 percent per year. Also without considering systematic risk, excess returns are negative. Hence, our results are robust with regard to the financial crisis.

Further, our sample contains five LPE entities that either delisted or entered into a realization phase during the measurement period. While the non-listed universe of buyout funds is not exempt from non-successful funds, we investigate the impact of these entities on our results. The average risk-adjusted excess return improves from -2.4 percent to -1.5 percent, while the median remains stable. Notably, performance is diverse across these non-surviving LPE entities. Candover Investment plc, which acquired the yacht builder Ferretti in a EUR 1.7 billion leveraged buyout in the run-up of the financial crisis (Arnold, 2009), lost 77 percent of its market capitalization over our measurement period from 2007 to 2014, while Northern Investors Company PLC and TVC Holdings are top performers in our sample, possibly because of high yields from the realization of net asset value while trading at discounts to NAV.

5.1.3 Robustness checks

Our results are based on an assumption of risky interest tax shields and calculated with debt betas set to zero. Relaxing the assumption of risky tax shields has no effect on our results. The average risk-adjusted excess return remains stable, and the median improves from -4.6 percent to -3.6 percent per year. Setting the debt beta to 0.375, based on an average yield (over LIBOR) for buyout debt of 3 percent and an assumed equity risk premium of 8 percent, has no effect on the median risk-adjusted excess return and deteriorates the average by one percentage point (Ivashina and Kovner, 2011; Phalippou 2012b). Thus, our results are robust to these assumptions.

¹⁷ The RTS2 Index comprises second-tier companies on the Moscow Stock Exchange.

¹⁸ See LPEQ (2015)

5.2 Market risk over time

While literature on private equity performance typically relies on assumptions of leverage, our approach of specifying the operating and leverage risk at the level of individual portfolio companies enables us to document risk characteristics both in the cross-section and over time. Table 5.1 above showed that systematic risk differs substantially across LPE entities, expressed as a standard deviation in the average entity betas of 0.56 around an average of 1.13. Entity betas show variation also over time, but to a less extent. The average standard deviation of individual entity betas during the measurement period is 0.36. Thus, systematic risk varies more in the cross section than over time in individual entities. Nevertheless, a standard deviation of 0.36 in individual entity betas shows that the systematic risk profile of individual LPE entities is unstable, with implications for investors that are estimating cost of capital when evaluating individual LPE entities.

On an aggregated level, Table 5.3 shows that the operating risk of the overall sample remain stable over time, while entity betas varies considerably. The entity beta largely follows the levels of leverage in portfolio companies, which increased from 0.5x in 2006, peaked at 0.8x amidst the financial crisis and thereafter converged towards 0.4x in 2014. Net cash positions at the entity level typically amounted to 20 percent of market capitalizations, expressed as negative leverage of -0.2x that decreases the systematic risk of LPE entities.

Table 5.3 Risk Characteristics Over Time

All figures refer to equally-weighted averages of the overall sample.

	2006	2007	2008	2009	2010	2011	2012	2013	2014
N	7	12	13	15	16	16	16	16	13
Unlevered Portfolio Beta	0.77	0.78	0.81	0.82	0.84	0.84	0.84	0.83	0.85
Portfolio Beta	1.14	1.28	1.46	1.39	1.24	1.28	1.27	1.22	1.23
Entity Beta	0.90	1.03	1.16	1.47	1.17	1.15	1.08	1.20	1.33
Leverage in Portfolio Companies	0.5x	0.6x	0.8x	0.7x	0.5x	0.5x	0.5x	0.4x	0.4x
Leverage at the Entity level	-0.2x	-0.2x	-0.2x	0.1x	-0.1x	-0.1x	-0.2x	-0.2x	-0.2x
Combined Leverage	0.2x	0.3x	0.4x	0.7x	0.4x	0.4x	0.3x	0.2x	0.1x

5.3 Gross-of-fees performance

LPE entities are intermediaries that deploy third-party capital in non-listed companies. Similar to non-listed funds or any other professional asset manager, fees are charged or costs incurred depending on whether the LPE entities are structured as funds or investment companies. We estimate gross-of-fees performance through a back-of-the-envelope calculation as if these fees or costs had been distributed in cash to shareholders annually. We apply the typical fee structure of the funds in our sample, and make an assumption that costs in investment companies correspond to fees paid by funds.

As described, the funds in our sample charge fixed management fees in the range 1.5-2.2 percent of the fair value of investments and variable performance fees of 10-20 percent of realized returns exceeding a hurdle of 7-8 percent. These fee schemes correspond to those of non-listed funds. Phalippou and Gottschalg (2009) estimated total fees to amount to 6 percent per year over the life time of a non-listed

fund. Against this background, it is reasonable that total fees are in the range 2-6 percent per year, depending on crystallized performance fees. We calculate gross-of-fees performance for this range of fees, charged on the fair value of total investments, i.e. excluding cash. Results are displayed in Table 5.4.

Table 5.4 Estimated Gross-of-fees Performance

Gross returns are the annualized risk-adjusted excess returns in EUR as if an assumed total fee charge (as a % of average fair value of investments, i.e. excluding cash) had been distributed in cash to shareholders.

	Mean	Std. Dev	First Quartile	Median	Third Quartile
<i>Risk-adjusted Excess Return</i>	-2.4%	14.3%	-12.7%	-4.6%	3.6%
Gross returns (annualized), if fees were:					
2%	1.0%	13.4%	-7.2%	-0.8%	6.1%
3%	2.6%	13.0%	-4.7%	1.0%	7.3%
4%	4.3%	12.9%	-1.6%	3.0%	9.2%
5%	5.9%	12.7%	0.8%	4.6%	10.7%
6%	7.4%	12.5%	3.1%	6.1%	12.1%

If fees had been distributed in cash to shareholders annually, risk-adjusted excess returns turn positive for the average LPE entity at the 2 percent fee level, the median LPE entity at the 3 percent fee level, and the first quartile at 5 percent fee level. While our calculation is not based on actual fees or costs, positive gross performance at the 2 percent level suggest that the average LPE entity adds value in investments.

5.4 Comparison with related literature

Again, while most literature on private equity performance measure returns of non-listed funds that have realized their investments and distributed proceeds to investors, this study measures the returns of stock market exposure to an evergreen portfolio, which are determined not only by realized investments but also changes in expectations about unrealized and even future investments. Despite this major difference, and the fact that we observe more diverse market risk and weak absolute performance, relative risk-adjusted returns correspond well to broader literature on private equity performance.

Similar to large-scale studies on non-listed funds, we find three key similarities. First, we document a wide dispersion in returns, with some entities delivering strong outperformance and some entities losing almost all its value (e.g., Kaplan and Schoar, 2005; Higson and Stucke, 2012). Second, we find average underperformance net of fees and average outperformance gross of fees (Phalippou and Gottschalg, 2009). Third, relative private equity performance improves when compared to broader stock markets instead of small cap indices (e.g., Phalippou, 2012b; Higson and Stucke, 2012).

Our estimation of gross-of-fees performance fits in the broader context of professional asset managers. While financial intermediaries in the rational model by Berk and Green (2004) capture a rent that matches their abilities and deliver zero alpha to investors, empirical evidence shows that the average mutual fund has a positive abnormal performance gross of fees but negative net of fees and the average hedge fund has negative net alpha (Wermers and Moskowitz, 2000; Fung et al., 2008). As discussed, similar results are documented for private equity funds by Phalippou and Gottschalg (2009).

Further, we find similar evidence as Lahr and Herschke (2009) with regard to systematic risk of LPE entities structured as fund and investment companies. They find CAPM betas of 1.0 for funds and 1.4 for

investment companies. We estimate entity betas to 1.06 for funds and 1.25 for investment companies, and actual raw betas are 1.18 and 1.29, respectively. Thus, it appears that investment companies exhibit higher systematic risk than funds. While Lahr and Herschke (2009) were unable to unlever betas and identify the source of this difference, our method enables a full unlevering. We document unlevered betas of 0.78 for funds and 0.90 for investment companies. Although we must be careful in generalizing such small subsamples, we see two possible explanations arising from the fact that funds tend to be managed by pure private equity managers, while investment companies may have different backgrounds. First, as documented in several studies, private equity investments tend to be made in industries with lower risk and in companies with stable cash flows (e.g., Barber and Goold, 2007; Acharya et al., 2013; Gottschalg et al., 2013). Second, funds may have undrawn capital commitments to non-listed funds managed by its manager, and thus hold net cash in a larger extent.

Leverage in portfolio companies appears low compared to previous studies. However, it is inappropriate to make comparisons with most studies as they cover time periods prior to the financial crisis. For example, Achleitner et al. (2010) documented leverage of 1.6x at entry and 0.8x at exit for the average buyout transaction completed in Europe over the period 1991 to 2005, which is considerably higher than the average portfolio companies leverage of 0.5x of our sample. Ljungqvist and Richardson (2003) estimated the average portfolio beta to 1.08 in their sample US buyout funds from 1980 to 2001, when assuming industry-average leverage. If we apply the leverage levels of listed peer group companies on portfolio companies, we find comparable “industry-matched” portfolio betas of 0.94. Still, the fact that leverage in portfolio companies of our sample was twice as high as in listed peer group companies suggests that also listed private equity is characterized by leveraged returns.

6 Conclusions

We find that a hypothetical investor with a levered position in a small cap benchmark index would have been slightly better off than an investor in a listed private equity (LPE) entity. Our sample of 17 LPE entities shows an average negative risk-adjusted excess return or negative “alpha” of 2.4 percent per year over the period 2007 to 2014. We document a wide dispersion in returns, with the top quartile delivering excess returns. Our results hold also for post-crisis performance. Moreover, we estimate a slight outperformance gross of fees, suggesting that the average LPE entity adds value in investments.

The purpose of our study, conducted with greater level of detail in both selecting benchmark indices and determining systematic risk than previous studies, is to shed light on private equity performance in general. Our sample, which is geared towards Europe, was generated to include only listed equivalents of traditional non-listed buyout funds. The size of the sample and the time period for which we are able to investigate performance in a proper way was determined by the size of the LPE universe and availability of data. Although the exercise we conduct preferably should be done over a longer period of time and on a larger sample, our findings correspond to those of literature on non-listed funds.

Our findings from the listed segment of private equity support the picture put forward in recent literature on private equity performance, i.e. that the average private equity fund shows risk-adjusted underperformance net of fees relative to small cap indices, which are better benchmarks for private equity performance, but that there is a considerably heterogeneity across funds (e.g., Phalippou, 2012b).

On a final note, although the LPE asset class on the whole is diverse, we believe that the segment that has been the focus of this early study represent a growing opportunity to analyze the risk and return characteristics of private equity that are not yet fully understood.

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Appendix A. Literature overview

Literature Overview

A Public Market Equivalent (PME) above one indicates outperformance of a non-listed private equity fund; see definition in the Background section.

Author	Region	Sample	Source	Period	Method	Benchmark	Results
Non-listed Funds							
Harris et al.(2014)	US	598 buyout funds (1,200 in total sample)	Burgiss/ 200+ LPs	1984- 2008*	PME	S&P500, Russel2000	PME of 1.20 relative to S&P500, buyout PME of 1.16 relative to Russel2000
Gottschalg et al. (2013)	UK	20 buyout funds		1988- 2001*	PME	Eurostoxx, Eurostoxx sector indices	Buyout IRRs have a risk-adjusted positive spread of 11.5%
Phalippou (2012b)	US	392 buyout funds	Preqin	1993- 2010*	PME	S&P500, DFA mico- cap, F&F small-cap index	PMEs of 1.20 relative to S&P500, 1.00 to DFA micro-cap, and 0.96 relative to F&F Small Cap Index
Higson/Stucke (2012)	US	1,169 buyout funds, 85% of committed capital in the US	Cambridge Associates	1980- 2008*	PME	S&P500, S&P600	Alpha of 5% relative to S&P500 and 1.8% relative to small-cap S&P600
Robinson/Sensoy (2011)	US	542 buyout funds (837 in total sample)	One LP	1984- 2009*	PME	S&P500	PME of 1.18, Risk-adjusted (beta 1.5) PME of 1.12
Phalippou/Gottschalg (2009)	US/ Europe	314 buyout funds (1,328 in total sample)	TVE	1980- 1993*	PME	S&P500	PME of 0.88 or -3% per year net of fees Risk-adjusted PME of 0.87 or -6% per year (industry- matched betas, declining leverage from 0.75) Risk-adjusted gross PME ~1
Kaserer/Diller (2009)	Europe	321 buyout funds (739 in total sample)	TVE	1980- 2003*	PME	MSCI Europe	PME 0.94 net of fees
Kaplan/Schoar (2005)	US	169 buyout funds (746 in total sample)	TVE	1980- 2001*	PME	S&P500	PME of 0.96 net of fees Slight outperformance gross of fees
Ljungqvist/Richardson (2003)	US	54 buyout funds (73 in total sample)	One LP	1981- 2001*	PME	S&P500, Nasdaq Composite	Industry-matched PME of 1.12 Portfolio beta of 1.08 (std. dev of 0.11)
Listed Entities							
Lahr/Herschke (2009)	Europe/US	116 investment companies, 109 funds		1986- 2008	CAPM	MSCI World	Betas of 1.4 (investment companies) and 1.0 (funds) Insignificant alphas of 3.5% (investment companies) and -0.3% (funds)
Lahr (2010)	Europe/US	446 LPE entities		1986- 2008	CAPM	MSCI World	Unstable individual CAPM betas, variation over time

*Time period over which funds were raised.

Appendix B. Initial sample

Initial Sample, Market Capitalization Over Time

The initial sample contains all LPE entities that are the listed equivalents of non-venture non-listed funds. It was derived from the database of LPX GmbH, the main LPE index provider. It was further narrowed to a final sample by imposing restrictions regarding the required level of detail by our method. Our sample generation process is described in the Sample and Data section.

Market Capitalization, EUR million	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Aberdeen Development Capital PLC	48	33	29	38	36	29	20	18	8	4	2	2			
*Altamir	77	35	32	32	62	82	96	268	92	192	234	219	270	377	377
*ARC Capital Holdings							479	687	215	423	544	237	193	142	59
Arques Industries AG		1	2	26	120	243	356	620	67	38	135	123			
Aurelius AG							60	323	148	97	173	234	384	935	997
*Aurora Russia Limited							68	65	12	27	42	36	34	17	4
Better Capital Limited Cell 2009										226	247	277	351	380	235
Better Capital Limited Cell 2012													225	450	338
*Brait S.A.												963	1 677	1 869	2 902
*Bure Equity AB	633	348	124	39	72	146	226	437	189	171	327	153	209	238	289
*Candover Investments plc	141	138	166	196	233	323	385	380	181	91	145	100	73	85	87
China Merchants China Direct Investments Limited	25	46	39	55	51	61	252	469	123	242	245	143	186	156	226
Compass Diversified Holdings							266	322	254	326	610	462	539	690	729
*Dinamia Capital Privado, S.C.R., S.A.	88	96	98	108	130	221	281	251	110	161	140	64	89	114	137
*Dunedin Enterprise Investment Trust PLC	44	49	42	55	75	105	98	98	51	71	80	84	100	92	74
*Electra Private Equity PLC	931	515	316	423	383	467	551	581	202	427	591	499	677	841	1 075
*Eurazeo S.A.	3 216	2 532	2 142	2 323	2 907	4 545	5 584	4 733	1 855	2 694	3 218	1 736	2 390	3 721	4 026
Heliad Equity Partners GmbH & Co. KGaA					5	10	54	71	24	41	50	26	17	22	40
*HgCapital Trust plc	142	121	85	103	161	214	273	268	176	240	365	370	445	454	509
k1 Ventures Limited	167	199	140	161	220	312	309	228	152	172	189	98	202	241	253
Kuala Limited							24	24	3	8	4	4	3	9	3
Kubera Cross Border Fund Limited							144	129	54	43	71	66	50	34	28
Management & Capitali							496	404	214	67	102	95	79	76	42
Marfin Investment Group S.A.	61	70	28	23	175	1 000	2 212	4 930	2 167	1 513	539	284	330	293	178
*Northern Investors Company PLC							144	129	54	43	71	66	50	34	28
*OFI Private Equity Capital SCA	34	30	38	24	33		45	83	81	46	91				
Promethean PLC						75	79	89	41	25	16	19	10		
*Ratos AB	722	812	836	1 000	1 287	1 680	2 927	3 006	1 431	2 156	4 514	2 954	2 434	2 352	1 836
*Symphony International Holdings Limited								211	70	158	174	160	265	289	351
*TVC Holdings								123	44	66	62	76	82	61	
Unternehmens Invest AG	94	44	43	44	36	46	66	74	52	37	32	44	80	103	90
*Wendel S.A.			1 230	1 894	3 200	4 579	6 168	4 978	1 783	2 159	3 477	2 604	3 931	5 149	4 442
Total Market Capitalization, EUR billion	6.4	5.1	5.4	6.5	9.2	14.2	21.7	24.0	9.9	12.0	16.5	12.2	15.4	19.2	19.4

*Included in final sample

Appendix C. Final sample

Final Sample, Descriptions of LPE Entities

	Exchange	Currency	Status	Launch Year*	Structure	Investment Manager	Key Region	Style
Altamir	Paris	EUR	Active	1995	Fund	Apax	Europe	Buyout
ARC Capital Holdings	London	USD	Realisation	2006	Fund	ARC Capital Partners	China	Growth
Aurora Russia Limited	London	GBP	Realisation	2006	Fund	Aurora Investment Advisors	Russia	Buyout
Brait S.A.	Luxembourg	ZAR	Active	1999	Investment C.	-	Africa	Buyout
Bure Equity AB	Stockholm	SEK	Active	1993	Investment C.	-	Nordics	Buyout
Candover Investments plc	London	GBP	Realisation	1984	Fund	Arle Capital Partners	UK	Buyout
Dinamia Capital Privado, S.C.R., S.A.	Madrid	EUR	Active	1997	Fund	N+1 Capital Privado	Spain	Buyout
Dunedin Enterprise Investment Trust PLC	London	GBP	Active	1987	Fund	Dunedin LLP	UK	Buyout
Electra Private Equity PLC	London	GBP	Active	1976	Fund	Electra Partners	UK	Buyout
Eurazeo S.A.	Paris	EUR	Active	2001	Investment C.	-	Europe	Buyout
HgCapital Trust plc	London	GBP	Active	1989	Fund	HgCapital	Europe	Buyout
Northern Investors Company PLC	London	GBP	Realisation	1990	Fund	NVM Private Equity	UK	Buyout
OFI Private Equity Capital SCA	Paris	EUR	Acquired by Eurazeo (2011)	2007	Fund	OFI Private Equity	Europe	Buyout
Ratos AB	Stockholm	SEK	Active	1954	Investment C.	-	Nordics	Buyout
Symphony International Holdings Ltd	London	USD	Active	2007	Fund	Symphony Inv. Managers Ltd	Southeast Asia	Buyout
TVC Holdings	London	GBP	Realisation	2007	Investment C.	-	UK	Buyout
Wendel S.A.	Paris	EUR	Active	2002**	Investment C.	-	Europe	Buyout

*Launch year refers to the year of listing on a stock exchange, while Brait S.A., Eurazeo S.A. and Wendel S.A. and Northern Investors Company PLC classify as listed private equity entities at later points in time because of changes in business models.

Appendix D. Sector exposure by LPE entity

Sector Exposure by LPE Entity

Values refer to equally-weighted averages.

NAICS 2012 Industry Codes	11	21	22	23	31-3	42	44-5	48-9	51	52	53	54	55	56	61	62	71	72	81	92
Altamir			12%		6%	3%	16%		26%	6%	1%	12%		3%	2%	12%				
ARC Capital Holdings					34%	44%	8%	3%	2%						9%					
Aurora Russia Limited							22%		19%	59%										
Brait S.A.					15%		85%													
Bure Equity AB					37%				3%	19%	2%	12%			27%	0%				
Candover Investments plc		24%			38%	1%		3%	5%	3%		7%		1%			17%			
Dinamia Capital Privado, S.C.R., S.A.					21%	35%	5%		0%		3%	6%		4%	3%	5%	2%	7%	8%	
Dunedin Enterprise Investment Trust PLC		1%		1%	35%			10%		7%	6%	10%		29%						
Electra Private Equity PLC				1%	44%	6%	1%	3%	4%	11%	16%	5%		1%	0%	3%	1%	6%		
Eurazeo S.A.	0%		2%		14%	15%	6%		2%	3%	34%	1%		10%		0%		8%	6%	
HgCapital Trust plc		3%	6%		11%	8%	3%		37%		2%	11%		8%		8%	3%	1%		
Northern Investors Company PLC				2%	22%	8%	0%		3%		12%	33%		13%		3%		3%	0%	
OFI Private Equity Capital SCA	16%				45%	4%								3%				14%	17%	
Ratos AB		3%		1%	48%	20%			14%			6%		4%					4%	
Symphony International Holdings Ltd				47%	0%	1%	0%		1%		1%					9%		39%		
TVC Holdings									79%			18%						2%		
Wendel S.A.					58%				42%											
Average	1%	2%	1%	3%	25%	8%	9%	1%	14%	6%	5%	7%	0%	5%	2%	2%	1%	5%	2%	0%

NAICS 2012 Industry Codes

11 - Agriculture, Forestry, Fishing and Hunting,
 21 - Mining, Quarrying and Oil and Gas Extraction,
 22 - Utilities,
 23 - Construction,
 31-33 - Manufacturing,
 42 - Wholesale trade,
 44-45 - Retail trade,
 48-49 - Transportation,
 51 - Information,
 52 - Finance and Insurance,

53 - Real Estate and Rental and Leasing,
 54 - Professional, Scientific and Technical Services,
 55 - Management of Companies and Enterprises,
 56 - Administrative and Support and Waste Management and Remediation Services,
 61 - Educational Services,
 62 - Health Care and Social Assistance,
 71 - Arts, Entertainment and Recreation,
 72 - Accommodation and Food Services,
 81 - Other Services (excl. Public Administration),
 92 - Public Administration

Appendix E. Distribution of portfolio companies by country

Distribution by Country

Distribution by country of the total number of identified portfolio companies held by our overall sample from 2007 to 2014.

	Number of Portfolio Companies	Share, %	Cumulative Share, %
UK	152	34%	34%
France	88	20%	53%
Sweden	58	13%	66%
Spain	25	6%	72%
Germany	15	3%	75%
Italy	12	3%	78%
Netherlands	12	3%	81%
US	13	3%	84%
China	9	2%	86%
Finland	7	2%	87%
Norway	9	2%	89%
Belgium	5	1%	90%
Cayman Islands	3	1%	91%
Denmark	5	1%	92%
India	4	1%	93%
Ireland	3	1%	94%
Russia	4	1%	94%
Singapore	5	1%	96%
Switzerland	4	1%	96%
Thailand	5	1%	98%
Bermuda	1	0%	98%
Brazil	1	0%	98%
Canada	1	0%	98%
Cyprus	0	0%	98%
Japan	2	0%	99%
Luzembourg	1	0%	99%
Malaysia	2	0%	99%
Portugal	1	0%	100%
South Africa	2	0%	100%
Total	449	100%	