Private Equity Fund Level Return Attribution: Evidence from U.K. Based Buyout Funds*

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Executive Summary

This report investigates components of private equity buyout fund returns using a unique anonymised dataset provided by a major Fund of Funds, Pantheon Ventures, in collaboration with BVCA. In contrast to a number of recent studies, which examine the components of the gross returns generated by private equity funds at the deal level (e.g. Acharya and Kehoe, 2008), we focus on returns at the fund level *net* of fees and carry. This net-of-fee perspective tends to be more relevant to the investors in this asset class.

We identify and measure the key components of fund-level net returns for a large sample of buyout funds with a strong UK presence by emphasizing the relevant market performance and the effect of additional leverage. Most importantly, we quantify the "Alpha" of these funds, i.e. their outperformance relative to equally risky public market investments.

We deviate from the standard approach to compare the long-term IRR of private equity investments to the annualized long-term passive ("buy-and-hold") returns from public market indices as this approach ignores the typically irregular timing of private equity fund investments' cash flows and the differences in operating and leverage risk between the private equity fund investments and 'the market' as captured by these indices. Instead, we capture these factors in a four-step decomposition of buyout returns into: (a) the portion driven by returns on the broad stock market ('Passive Return'), (b) the portion driven by investment timing and sector selection (c) the effect of the buyout-typical leverage on the buyout funds' returns and (d) the residual intrinsic value generation of the buyout fund, i.e. the private equity Alpha.

We compute the IRRs for a sample of 20 buyout funds based in the U.K. that have vintages before 2001 and whose investments are mainly in Europe. We choose funds with earlier vintages to minimize the measurement error associated with residual NAVs. The buyout funds' returns are significantly higher than the relevant benchmarks which attempt to mimic the investment strategy of the buyout funds by investing in market indices according to the precise timing of the funds' cash inflows and outflows net of fees. This provides evidence of the existence of a substantial Alpha for the private equity studied, i.e., additional returns that could not be replicated by the mimicking methodology. In our sample, the weighted average buyout fund performance generates a net IRR of 19.61% with an Alpha of 4.47%, which represents approximately 23% of the total return. Leverage contributes 7.71% to the return of the average buyout fund which represents 39% of the weighted average buyout fund performance in our sample. This magnitude while large suggests that the performance of buyout funds in our sample is not solely attributable to the effect of leverage. Buyout funds benefit from high leverage, but at the same time it is not leverage alone that drives their success.

1. Introduction

For several years, the question of the performance of private equity fund investments has attracted the attention of investors, academics and policy makers alike. Despite substantial research efforts, we are still missing a comprehensive and conclusive account of the attractiveness of this asset class, in particular relative to comparable public market investments.

In the case of the U.K. private equity market, the annual BVCA industry survey consistently shows attractive long-term performance net of fees. For example, the average since-inception return of the private equity funds was 15.9% annual IRR as of 31 Dec 2009, and the average 10 year return of these funds was 13.1% annual IRR. A number of factors make the comparison between such private equity funds returns and the return of public stocks inherently difficult. These include the general difference between money-weighted returns of private equity funds and the time-weighted returns of public stocks, the different risk characteristics between the two investment categories, the differences with respect to investment horizon and liquidity and the explicit and implicit cost of implementing a private equity investment program.

Accordingly, and despite the clear and strong evidence provided by the annual BVCA industry survey, important investors are still reluctant to commit to private equity due to remaining scepticism on the ability of private equity to outperform the public market as well as the requirement to dedicate considerable time and resources to selecting private equity fund managers and tracking performance.

In the eyes of many investors, the recent boom of private equity was mainly attributable to the availability of high levels of debt financing at relatively attractive terms. Consequently, the recent high performance of this asset class is largely perceived to be due to these high levels of leverage. Thus, some investors question whether private equity was able to generate fundamental value beyond a return from similarly risky public market investments.

Some of the fundamental factors in the success of private equity seem to be considerably impaired these days, including the ability to obtain financial leverage at historical levels and terms. Combined with the broader issue of a reduced availability of investment capital, these factors explain the sharp decrease in private equity investment and fundraising levels since 2007. According to BVCA (2009), Private Equity and Venture Capital investment by UK-based firms was £7.5bn, in contrast with a total of £31.6 bn in 2007.

What is needed in this context is a clear and comprehensive account of the historical performance of U.K. private equity buyout funds in order to provide investors with reliable guidance regarding the attractiveness of private equity fund investments. We provide such evidence through a detailed assessment and quantification of the key components of fund-level net returns of a sample of UK-based funds. We place particular emphasis on the relevant market performance and the effect of additional leverage. This analysis allows us to measure the degree to which the absolute U.K. based fund performance is attributable to (a) market timing (b) exposure to a particular sector, (c) above-sector average level of financial leverage, and (d) private equity Alpha.

2. Previous Findings

The literature on private equity returns vs. public equity returns is mixed. Most statistics provided by industry associations as well as some academic papers report superior returns for private equity investments depending on the assumptions made. Ljungqvist and Richardson (2003), for example, evaluate 73 mature private equity funds of one large US-based investor over 1981 to 2001 and find that private equity investments of closed funds outperformed the S&P 500 by more than 5%. They also find that the main factor behind the large excess returns was the early timing of the investments. Similarly, a very recent study by BVCA concludes that UK private equity continues to outperform other asset classes. The report finds that the ten-year IRR for all funds stands at 13.1% against 3.1% for Total UK Pension Funds Assets and 1.6% for the FTSE all-share over the same ten year period.

Most academic studies point to an underperformance of the private equity asset class, on average. For instance, Kaplan and Schoar (2005) study the returns to private equity and venture capital funds. They compare how much an investor (or limited partner) in a private equity fund earned net of fees to what the investor would have earned in an equivalent investment in the Standard and Poor's 500 index. They find that private equity fund investors earn slightly less than the Standard and Poor's 500 index net of fees. On average, therefore, they do not find the outperformance often given as a justification for investing in private equity funds. At the same time, however, these results imply that the private equity investors outperform the Standard and Poor's 500 index gross of fees (that is, when fees are added back). This estimated performance depends critically on the valuation of non-exited investments at the end of the sample period. Kaplan and Schoar use funds' self-reported values of such non-exited investments. This problem has been alleviated recently since most buyout funds started to report non-exited investments at fair value.

A more recent and highly visible paper by Phalippou and Gottschalg (2008) corrects for several potential biases in the measurement of private equity returns (e.g., write-offs of non-exited investments after a certain period of time, risk adjustments) and finds that private equity funds underperform the S&P 500 by 3% to 6% per year once they make these adjustments.

These prior academic studies that investigate the performance of the average buyout fund do not capture the significant variance in the funds' returns which is a function of either fund specific characteristics or vintage year. Lerner, Schoar, and Wong (2007) document a wide dispersion of returns among private equity funds. An potential explanation for the considerably high standard deviation of returns is the concentrated nature of private equity funds. They find that private equity funds are more concentrated and often involve exposure to fewer than 15 private companies.

However, existing fund-level studies rely on some form of assumption regarding the risk attributes of the underlying investments as the required data for an exact consideration of investment risk was not available. As demonstrated by Groh and Gottschalg (2009) on

a sample of 119 US buyout deals, the exact assessment of investment risk is crucial for an accurate assessment of the performance of private equity returns relative to the public markets.

Thanks to the unique characteristics of our sample, we are able to perform an assessment of the net performance of private equity returns relative to the public markets based on a fund-level analysis, while at the same time capturing the essential risk attributes of these investments.

3. Methodology

It is standard practice in the private equity industry to report performance either as a (undiscounted) ratio of cash proceeds over cash investments ("multiple") or as the annualized internal rate of return of all corresponding cash flows ("IRR"). Each of these measures has important limitations. The "multiple" does not consider the "time value of money" and the information that, for instance, a private equity fund doubled investors' money is of little value unless we know for how long their money had been invested. One important advantage of the IRR is the fact that it considers the "time value of money" so that the timing of the underlying cash flows has a great influence on its measurement. This aspect and the fact that IRR is a widely used measure in the industry are the main reasons why we decide to measure the performance of the buyout funds using IRRs[1].

The standard approach used in most industry statistics is to compare the long-term IRR of private equity investments to the annualized long-term passive ("buy-and-hold") returns from public market indices. However this approach ignores important aspects, such as the irregularly timed cash flows of private equity fund investments and the differences in operating and leverage risk between private equity fund investments and

[1] For shortcomings of the use of IRR see, for example, Ludovic Phalippou, The Hazards of Using IRR to Measure Performance: The Case of Private Equity; http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1111796

'the market' as captured by these indices. These issues confound attempts to compute standard time weighted returns typical of publicly traded assets for comparison. The IRR, a cash flow weighted return rate, which is widely used for ranking competing funds, cannot be directly compared with the time weighted public benchmarks. More importantly, since IRR does not measure the opportunity cost of capital, it ignores the benchmarking objective.

We proceed in four distinct stages to provide a more accurate account of the relative performance of private equity fund investments and to gain further insights into the different components of private equity returns.

We start by computing the IRR of each of the funds in the database based on the net of fees cash inflows and outflows. We consider the residual values of unrealized investments (i.e., the Net Asset Values or NAVs) as accurately reflecting the net-present-value of these investments and treat them as a final cash inflow in the IRR calculation.[2] This IRR measure of the fund net cash flows is the 'PE Return' to which other return figures will be compared.

Second, we replicate the approach used in standard industry statistics and calculate the compounded annualized passive ("buy-and-hold") returns from a public market index over the period from the first cash flow to a last cash flow of each of the funds in the database. The IRR that results from this computation is the return that could be obtained by an investor that makes investments in the amount of the capital committed to each buyout fund at the day of the fund's first cash flow and liquidates this position at the day of the fund's final NAV.

In a third step, we consider the particular timing of the cash flows and the operating risk of the private equity funds to compute an industry-matched (unleveraged) Public Market Equivalent (PME) return. Similar to the approach taken by Kaplan and Schoar (2005) and Phalippou and Gottschalg (2009), we impose the observed annual net cash flows from private equity on a public market index by purchasing shares to represent negative net

[2] We perform sensitivity checks with respect to this assumption later.

cash flows and selling shares to represent positive net cash flows. As we aim to capture the operating risk of the underlying investments, we do not invest in the overall market index but replicate the industry mix of each fund. This industry mix is changing from one year to another to track any industry changes that occur at the fund level. Detailed times-series information on the industry mix is available for the funds for which we have deal-level data available. For the minority of funds that do not have this data available, we use industry mix annual averages derived from the HEC Buyout Database (see Table 3). To calculate the industry-matched (unleveraged) Public Market Equivalent (PME) return, we construct portfolio holdings in sector indices according to the industry mix at the fund level and then calculate the final value of the public equity market portfolio created based on the market value of the portfolio on the last day of the fund (i.e., the day on which the net asset value of the fund is available). One can think of this value as being the additional final cash flow representing the liquidation value of the final public equity market portfolio. We calculate the IRR of the industry-matched (unleveraged) public market equivalent by using both the mimicking annual net cash flows and the final cash flow. If the final value of the industry-matched (unleveraged) PME portfolio is positive, it implies that the public market has produced a greater return than the private equity whose cash flows were superimposed on the public market index. If the final value of the industry-matched (unleveraged) PME portfolio is negative, it implies that the public market has produced a smaller return than private equity. The IRR that results from this computation is the return that could be obtained by an investor that makes investments in the industry-matched bundles of public securities and exits these securities by mimicking exactly the timing of the private equity investments and exits.

Finally, we estimate the performance of buyout funds had they not been levered-up, but had the typical degree of leverage of publicly traded firms at the time. This enables us to differentiate between the portions of buyout returns attributable to fundamental performance on the one hand and the effect of higher leverage on the other. We assessed the difference between the average level of leverage of the portfolio of each buyout fund in each year and the level of leverage of industry-matched public market investments. Then we construct an investment vehicle that replicates the level of

leverage of industry-matched public market investments for each buyout fund and calculate the IRR of cash flows that investors in these vehicles would have achieved.

This four-step approach allows us to decompose the buyout funds' returns into four elements: (a) the portion driven by returns on the broad stock market ('Passive Return'), (b) the portion driven by the performance differential between the broad stock market and returns of the industry sectors in which the fund invests after taking into account the timing of these investments, (c) the effect of the buyout-typical leverage on the buyout funds' returns and (d) the residual intrinsic value generation of the buyout fund, i.e. the private equity Alpha.

4. Data

Initial Dataset

- The Fund of Funds, Pantheon Ventures, shared with us an anonymised dataset of 64 buyout funds that were/are part of their portfolio. The Fund of Funds did not apply any qualitative filters to the dataset except requiring data availability and the criteria that the funds must be managed by a buyout firm with a strong UK presence. These funds cover a range of vintage years from 1988 to 2009. In Table 1 below we present the distribution of the full set of funds by vintage year. The vintages are reasonably spread over the 21 year period although we note that there are few vintage years when the number of funds added to the portfolio was larger (2001, 2005 and 2007).
- Out of the total number of funds, 46 funds were still active at the time when the dataset was extracted and the NAV was computed. Most of the funds (41) have a pan-European investment focus while the remaining invest mainly in the U.K.
- The dataset shared by the Fund of Funds makes available cash flow data with precise timing at the fund level. These funds were raised in three currencies: GBP, Euro and USD. We convert all the fund cash flows into GBP using historical exchange rates to remove the effect of currency fluctuations on our results. We focus our attention on the net performance, based on cash flows to and from investors *net* of all fees charged by the buyout funds.

- Overall, these funds invested in 1,138 companies located mainly in Europe although there are few exceptions. We present in Table 2 the distribution of portfolio company investments over time. We notice a larger number of investments in years 2000, 2001 and 2005 which is reflecting the buoyant private equity investment climate in these periods.
- The portfolio companies are in several industries that we manually classified, based on prior research, into nine major and relatively homogenous industries: Finance, Food, Health, Retail, Natural Resources, Services, Transport, Industrial and High-tech. We create a catch-all category called Unknown if we are not able to classify the firms in any of the 9 industries above.[3] We present in Table 3 the allocation of portfolio investments by industry and year. This distribution is used whenever no exact deal-level industry information is available. We highlight that a large proportion of the investments is made in low-risk industries such as Industrials and Services.

[3] Less than 3% of the companies are classified in this category.

Table 1. Distribution of the Full Set of Funds By Vintage (full sample of 64 buyout funds)

Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1988	1	1.56	1	1.6
1989	1	1.56	2	3.1
1994	3	4.69	5	7.8
1995	2	3.13	7	10.9
1996	3	4.69	10	15.6
1997	5	7.81	15	23.4
1998	1	1.56	16	25.0
1999	2	3.13	18	28.1
2000	5	7.81	23	35.9
2001	7	10.94	30	46.9
2002	2	3.13	32	50.0
2003	4	6.25	36	56.3
2004	2	3.13	38	59.4
2005	9	14.06	47	73.4
2006	5	7.81	52	81.3
2007	8	12.5	60	93.8
2008	3	4.69	63	98.4
2009	1	1.56	64	100.0

Table 2. Distribution of Portfolio Companies by Year of Investment (full sample of 64 buyout funds)

Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1988	11	0.97	11	0.97
1989	17	1.49	28	2.46
1994	49	4.31	77	6.77
1995	51	4.48	128	11.25
1996	80	7.03	208	18.28
1997	99	8.70	307	26.98
1998	11	0.97	318	27.94
1999	93	8.17	411	36.12
2000	105	9.23	516	45.34
2001	196	17.22	712	62.57
2002	49	4.31	761	66.87
2003	57	5.01	818	71.88
2004	36	3.16	854	75.04
2005	156	13.71	1010	88.75
2006	61	5.36	1071	94.11
2007	57	5.01	1128	99.12
2008	9	0.79	1137	99.91
2009	1	0.09	1138	100.00

Table 3. Allocations of Investments by Industry and Year (Source: HEC Buyout Dataset)

Year	Finance	Food	Health	High-tech	Industrial	Natural resources	Retail	Services	Transport
1990	1%	16%	9%	10%	21%	0%	6%	31%	7%
1991	6%	12%	2%	15%	14%	4%	5%	36%	6%
1992	5%	11%	1%	9%	39%	14%	1%	15%	5%
1993	24%	25%	6%	6%	21%	1%	3%	8%	6%
1994	4%	5%	2%	28%	19%	8%	13%	9%	12%
1995	7%	4%	9%	5%	24%	4%	12%	21%	14%
1996	15%	1%	7%	9%	27%	4%	4%	19%	14%
1997	9%	7%	20%	13%	17%	3%	10%	17%	5%
1998	7%	9%	4%	8%	26%	4%	7%	29%	5%
1999	7%	4%	7%	17%	27%	3%	2%	26%	6%
2000	3%	15%	6%	20%	28%	5%	3%	9%	13%
2001	3%	4%	15%	12%	28%	6%	3%	22%	6%
2002	7%	13%	11%	2%	22%	3%	3%	16%	23%
2003	4%	7%	3%	29%	19%	3%	8%	15%	12%
2004	4%	1%	10%	8%	33%	3%	13%	12%	15%
2005	12%	3%	10%	16%	32%	5%	3%	14%	6%
2006	1%	5%	7%	25%	17%	6%	6%	24%	9%
2007	3%	0%	5%	6%	28%	5%	12%	32%	9%
2008	1%	5%	7%	25%	17%	6%	6%	24%	9%
2009	1%	5%	7%	25%	17%	6%	6%	24%	9%

Dataset used in the analysis

- Because the buyout funds realize the proceeds from investments primarily during the second half of their life, the performance of a given private equity fund can be measured with reasonable accuracy towards the end of its life. At that stage, most of the investments are exited and the residual net asset values are small relative to the size of the fund's investments. This restricts our ability to assess the performance of private equity relative to the public markets for funds that have been raised recently. As a result, we decide to focus on all funds that were raised before 2001. We expect the measurement error associated with the residual NAV values to have a lower impact on the level of performance that we measure since they are closer to the end of their life and are expected to have realized most of their viable investments by the end of our sample period.[4] We present a list of this sub-sample of 20 buyout funds in Appendix A. As expected, the NAVs of these funds (last column) are very small relative to their size. Most funds were raised in Sterling and Euro except one fund that was raised in US Dollars.
- In Table 4 we report the distribution of this sub-sample of funds by vintage year. In Table 5 we report the distribution of these funds by size as reported in the original dataset received (due to confidentiality agreements, the Fund of Funds could only share ranges of fund sizes with us). While there is significant variation in the sizes of these funds, 55% of them are funds with a size under 500 million.
- In Appendix B we present detailed descriptive statistics on the portfolio investments made by the pre-2001 vintage funds . The buyout funds made a total of 455 investments. The average size of an investment is 49 million sterling and the largest investment made in our sample is 395 million sterling. As expected given the U.K. focus of the funds in our sample, approximately 60% of the portfolio companies are located in the U.K. The second and third largest groups are in Germany (11.43%) and U.S (5.49%). Most investments are made in Sterling (49%) and Euro (45.71%).

[4] As a sensitivity check, we run our results for alternative vintage year cut-offs. The results we obtain are qualitatively very similar to the ones we report for samples of funds that were raised before 2000, 2002 or 2003.

Table 4. Distribution of Funds Used in the Analysis By Vintage Year (analysis sample of 20 buyout funds)

Vintage Years	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Before 1996	5	25.00%	5	25.00%
1996	3	15.00%	8	40.00%
1997	5	25.00%	13	65.00%
1998	1	5.00%	14	70.00%
1999	2	10.00%	16	80.00%
2000	4	20.00%	20	100.00%

Table 5. Distribution of Funds Used in the Analysis By Fund Size (analysis sample of 20 buyout funds)

Buyout Fund Size	Frequency	Percent	Cumulative Frequency	Cumulative Percent
less than 300 mil.	8	40.00%	8	40.00%
300 mil. - 500 mil.	3	15.00%	11	55.00%
500 mil. - 1000 mil.	2	10.00%	13	65.00%
1000 mil. - 3000 mil.	5	25.00%	18	90.00%
more than 3000 mil.	2	10.00%	20	100.00%

Other relevant data used in the analysis

- In order to implement our market mimicking strategy, we compute several variables with data from independent sources.
- We retrieve cost of debt financing measures in Europe from the Loan Pricing Corporation. This database provides spreads over standard benchmarks (mainly LIBOR) for leveraged syndicated term loans used in buyout transactions throughout Europe. We aggregate this borrower specific loan data and use time-varying measures of cost-of-debt buyout financing in our analysis. More specifically, we compute annual averages for the interest rates demanded by banks in these loan contracts.
- We retrieve Debt/Equity ratios for leveraged buyout transactions in Europe from a combined Incisive Media and Capital IQ dataset. These two datasets are expected to cover a very large percentage of the buyout transactions in Europe

and are thus representative of the leveraged debt market conditions. We compute averages of these ratios by industry and year.

- We retrieve similar Debt/Equity ratios for public companies in Europe from Datastream. We aggregate these ratios into averages by industry and year.
- We retrieve daily EU overall market and industry specific indices from Global Financial Data. We use these Stoxx market and sector daily indices as market benchmarks in our analysis.[5]
- We retrieve daily exchange rates from the historical exchange dataset provided by Global Financial Data in order to convert the non-sterling denominated cash flows of all funds into sterling.
- We retrieve annual average levels of buyout fund investments by industry from the HEC Buyout Database. This distribution is used whenever no exact deal-level industry information is available in our data.

5. Results

- We compute the IRR for each of the funds in the sample using the cash flows in and out of the funds net of fees that we have available. Our algorithms converge (i.e., provide unique IRRs) for 20 buyout funds out of the 23 buyout funds in the original sample that have vintages before 2001. We consider funds' positive NAVs as the last cash flow and discount it accordingly given the date when the NAV has been assessed by the fund. In alternative sensitivity tests, we set these NAV values to zero and the magnitude of the IRRs we obtain is very similar. In other words, the magnitude of NAVs does not have a major impact on our performance measures.
- We present the distributional characteristics of the buyout funds' IRRs in the last column of Table 6 below. The average buyout return is 22.21% and is significantly different from zero based on a simple t-statistic test. The bottom quartile funds

[5] EuroStoxx Total Return Index and EuroStoxx Sector indices are compiled by Dow Jones, in conjunction with the Paris SBF, the Frankfurt Deutsche Borse and the Zurich Stock Exchange. For most sector indices the daily coverage starts in 1986 while for the Total Return Index the coverage starts in 1951. We use the following Stoxx sector indices: Financials, Food, Healthcare, Retail, Basic Resources, Services, Transportation, Industrials, and Technology.

have returns up to 5.55% while the top quartile funds have returns of at least 28.30%. The median fund has a return of 16.17%, lower than the average fund, suggesting that the distribution of the returns is skewed to the right.

- For benchmarking purposes, we also compute the IRRs of three alternatives as described in the Methodology section above: the passive buy and hold return, the industry-matched unlevered return and the buyout funds' returns after removing the effect of leverage. We adjust the industry-matched unlevered PME return by deducting 50bp to account for the potential cost of transactions involved in the PME methodology. As can be seen in Table 6, the average buyout return after removing the effect of leverage decreases to 13.31%, still significantly higher than the average return on a passive buy and hold strategy (3.82%). The return on the industry-matched unlevered PME is 14.69%, statistically insignificantly different from the unlevered buyout return. However, the median unlevered buyout return is significantly higher than the median industry-matched unlevered PME based on a non-parametric test of differences. This provides an early indication of the existence of a private equity Alpha, i.e., additional returns that could not be replicated by the PME methodology. Positive differences for both the first and the third quartiles between the unlevered buyout return and its industry-matched unlevered PME benchmark further support our inferences.

Table 6. Distribution of Buyout Funds' Returns
(analysis sample of 20 buyout funds)

Statistic	Passive Return	Industry-Matched Unleveraged PME	Unlevered Buyout Return	Buyout Return
Simple Mean	3.82%	14.69%	13.31%	22.21%
25th percentile	1.38%	-0.50%	6.49%	5.55%
50th percentile	2.93%	2.62%	9.76%	16.17%
75th percentile	6.82%	13.43%	16.61%	28.30%

- Given the large variation in fund sizes, we aggregate the overall performance of the buyout funds in our sample by computing a fund size-weighted average of the

individual funds' IRRs. Similarly, we aggregate the performance on the three benchmarks above.

- *Impact of Leverage:* As can be seen in the Figure 1 below, the fund size weighted IRR drops to 19.61% relative to the simple mean. The weighted average unlevered buyout fund return is 11.90%. In other words, leverage adds 7.71% to the return of the average buyout fund which represents 39% of the average buyout fund performance in our sample (see Figure 2 below). As a result, the performance of buyouts had they not been levered-up corresponds to 61% of the average buyout performance in our sample suggesting that more than half of the performance of the buyout funds in our sample is *not* attributable to the effect of leverage alone. Buyout funds benefit from high leverage, but at the same time it is not leverage (alone) that drives their success.
- *Buyout Funds "Alpha"*: To assess the magnitude of the buyout funds' performance relative to the public market benchmarks we compare the unlevered buyout return (11.90%) with the industry-matched unlevered PME return for which the weighted average is 7.43%. Therefore, the buyout funds' Alpha is 4.47% which is significantly greater than zero (see Figure 1). Even if we factor out the effect of operational risks, the successful buyouts still create value beyond comparable public market investments. Although the public market investment vehicle we create with the PME methodology mimics the operating risk of the buyout funds by investing in indices that cover similar industries (and leaving the leverage effect aside), its performance remains below that of the average buyout fund: 23% of the average buyout performance in our sample is Alpha (see Figure 2) with a magnitude of about 447 bps. In Figure 3, we report a histogram with the Alphas computed for each individual fund in the sample. The histogram shows that 13 funds out of 20 have a positive Alpha (the last 3 bins in the histogram).
- We perform a number of sensitivity analyses to assess the magnitude of the leverage effect and that of the funds' Alpha: we find similar results when we use funds with vintages before 2000, 2002, 2003 and 2004. Consequently, the effect of the NAV's measurement is not significantly affecting our results. The funds'

Alpha varies between 10% and 23% and the effect of leverage is approximately 40% across all vintages.

- *Industry selection and Market Timing*: Finally, the comparison between the simple passive buy and hold return and the industry-matched unlevered PME return, which is 6.01% higher, suggests that market timing and industry selection contribute significantly to the overall return of the private equity funds. Such market timing might be difficult to achieve in practice. If that is the case, then the average private equity Alpha that we find is a conservative estimate.

Figure 1. Components of Buyout Funds' Returns

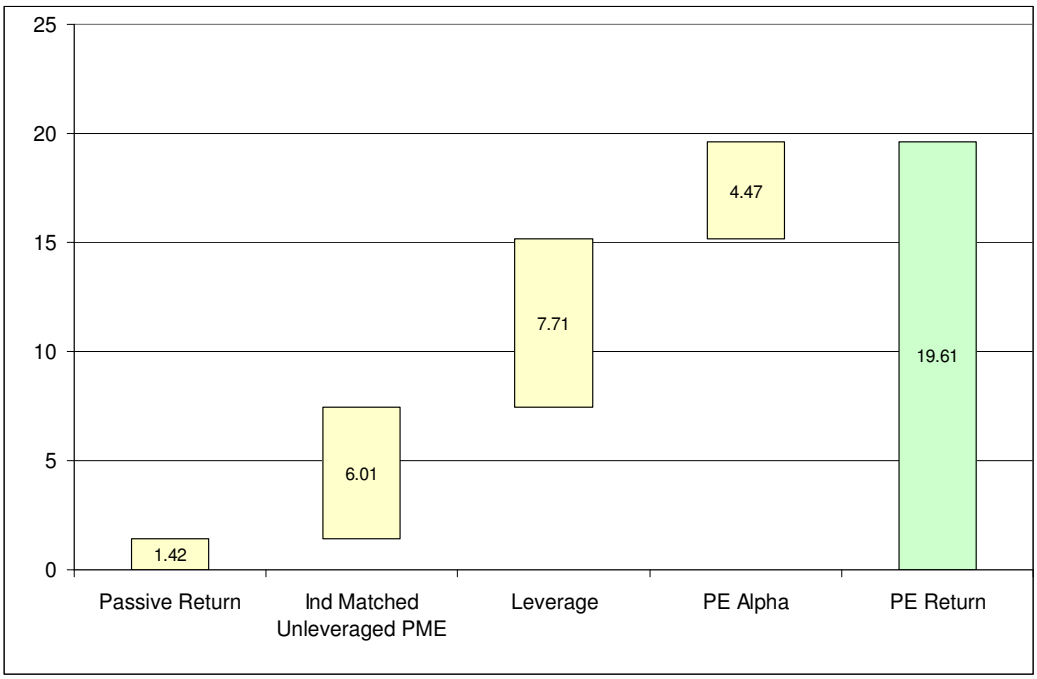


Figure 2. Percentage Contribution of Each Component to the Buyout Funds' Returns

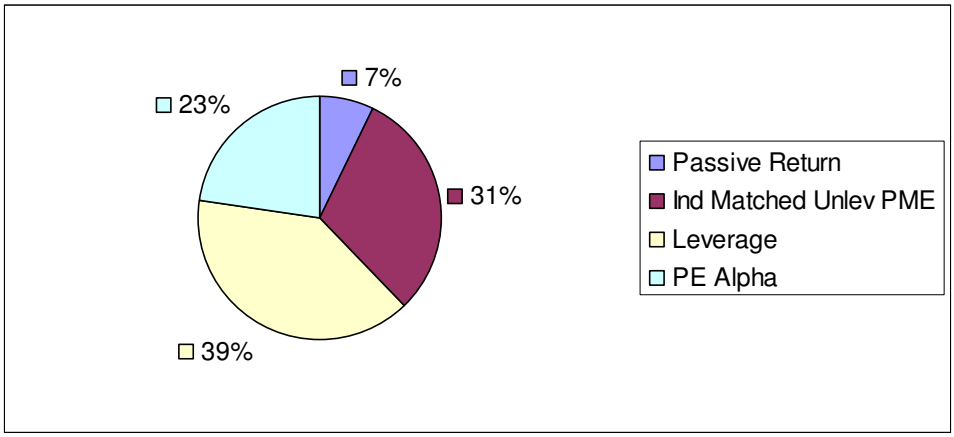
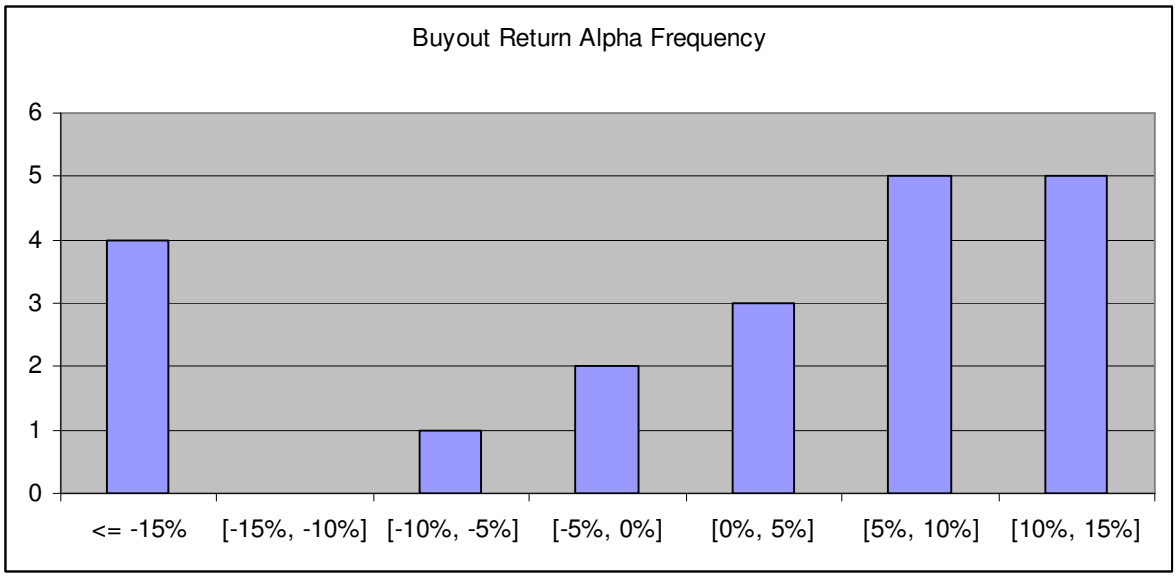


Figure 3. Histogram of Buyout Funds' Alphas by the Magnitude of the Return



6. Conclusions

We compute the IRRs for a sample of 20 buyout funds based in the U.K. that have vintages before 2001 and whose investments are mainly in Europe. We choose funds with earlier vintages to minimize the measurement error associated with residual NAVs. We provide the following main findings:

1) The buyout funds' returns are significantly higher than the relevant benchmarks which attempt to mimic the investment strategy of the buyout funds by investing in market indices according to the precise timing of the funds' cash inflows and outflows net of fees. This provides evidence of the existence of a "Alpha" for these private equity funds, i.e., additional returns that could not be replicated by

the mimicking methodology. In our sample, the buyout funds' alpha is 4.47%. That represents approximately 23% of the weighted average buyout fund performance which provides an IRR of 19.61%.

2) Leverage adds 7.71% to the return of the average buyout fund which represents 39% of the weighted average buyout fund performance in our sample. This magnitude while large suggests that the performance of buyout funds in our sample is *not* solely attributable to the effect of leverage. Buyout funds benefit from high leverage, but at the same time it is not leverage alone that drives their success.
3) Our results are robust to a number of sensitivity analyses. We find a positive PE alpha: a) when we use samples with funds that have vintages before 2000, 2002, 2003 and 2004; b) when we change the computation of the portfolio mimicking benchmarks to leveraged PMEs.

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Appendix A

Table A.1: Characteristics of the 20 buyout funds in the analysis sample[6]

Fund	Fund Size	Vintage	Fund Currency	Fund NAV (in mil.)
Fund 1	less than 300 mil.	1995	GBP	0.00
Fund 2	300 mil. - 500 mil.	1997	GBP	0.37
Fund 3	1000 mil. - 3000 mil.	1998	EUR	0.00
Fund 4	more than 3000 mil.	2000	EUR	18.57
Fund 5	300 mil. - 500 mil.	1994	GBP	0.00
Fund 6	1000 mil. - 3000 mil.	1997	GBP	0.02
Fund 7	less than 300 mil.	1988	GBP	0.00
Fund 8	1000 mil. - 3000 mil.	1997	USD	6.52
Fund 9	less than 300 mil.	2000	GBP	0.42
Fund 10	1000 mil. - 3000 mil.	1999	EUR	5.81
Fund 11	500 mil. - 1000 mil.	1997	EUR	0.14
Fund 12	more than 3000 mil.	2000	EUR	4.59
Fund 13	less than 300 mil.	1994	GBP	0.42
Fund 14	less than 300 mil.	1996	GBP	0.11
Fund 15	300 mil. - 500 mil.	2000	GBP	0.00
Fund 16	less than 300 mil.	1996	GBP	0.00
Fund 17	less than 300 mil.	1996	GBP	0.00
Fund 18	1000 mil. - 3000 mil.	1999	EUR	1.38
Fund 19	less than 300 mil.	1997	GBP	0.11
Fund 20	500 mil. - 1000 mil.	1995	GBP	0.00

[6] Note that the fund size ranges and the NAVs in the table are expressed in the currency indicated by the Fund Currency column.

Appendix B

Table B.1: Distribution of portfolio company investments by Fund

Fund	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Fund 1	36	7.91	36	7.91
Fund 2	32	7.03	68	14.95
Fund 3	11	2.42	79	17.36
Fund 4	19	4.18	98	21.54
Fund 5	14	3.08	112	24.62
Fund 6	8	1.76	120	26.37
Fund 7	11	2.42	131	28.79
Fund 8	13	2.86	144	31.65
Fund 9	18	3.96	162	35.60
Fund 10	21	4.62	183	40.22
Fund 11	26	5.71	209	45.93
Fund 12	20	4.40	229	50.33
Fund 13	24	5.27	253	55.60
Fund 14	36	7.91	289	63.52
Fund 15	15	3.30	304	66.81
Fund 16	38	8.35	342	75.16
Fund 17	6	1.32	348	76.48
Fund 18	72	15.82	420	92.31
Fund 19	20	4.40	440	96.70
Fund 20	15	3.30	455	100.00

Table B.2: Distribution of portfolio companies by year of investment (59 companies do not have this information available)

Year	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1994	9	2.27	9	2.27
1995	23	5.81	32	8.08
1996	26	6.57	58	14.65
1997	31	7.83	89	22.47
1998	46	11.62	135	34.09
1999	77	19.44	212	53.54
2000	95	23.99	307	77.53
2001	17	4.29	324	81.82
2002	20	5.05	344	86.87
2003	10	2.53	354	89.39
2004	16	4.04	370	93.43
2005	14	3.54	384	96.97
2006	12	3.03	396	100

Table B.3: Distribution of portfolio companies by country

COUNTRY	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Austria	2	0.44	2	0.44
Canada	1	0.22	3	0.66
Denmark	6	1.32	9	1.98
Finland	4	0.88	13	2.86
France	20	4.4	33	7.25
Germany	52	11.43	85	18.68
Greece	1	0.22	86	18.9
Ireland	1	0.22	87	19.12
Israel	6	1.32	93	20.44
Italy	15	3.3	108	23.74
Japan	1	0.22	109	23.96
Luxembourg	1	0.22	110	24.18
Netherlands	7	1.54	117	25.71
Norway	2	0.44	119	26.15
Rep.of Ireland	1	0.22	120	26.37
Romania	1	0.22	121	26.59
Spain	6	1.32	127	27.91
Sweden	17	3.74	144	31.65
Switzerland	4	0.88	148	32.53
UK	271	59.56	419	92.09
USA	25	5.49	444	97.58
Unknown	11	2.42	455	100

Table B.4: Distribution of portfolio companies by sector

Sector	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Finance	15	3.3	15	3.3
Food	9	1.98	24	5.27
Health	66	14.51	90	19.78
High-tech	148	32.53	238	52.31
Industrial	78	17.14	316	69.45
Natural resources	7	1.54	323	70.99
Retail	25	5.49	348	76.48
Services	83	18.24	431	94.73
Transport	11	2.42	442	97.14
Unknown	13	2.86	455	100

Table B.5: Distribution of portfolio companies by currency of investment

CURRENCY	Frequency	Percent	Cumulative Frequency	Cumulative Percent
CHF	1	0.22	1	0.22
EUR	208	45.71	209	45.93
GBP	223	49.01	432	94.95
SEK	3	0.66	435	95.6
USD	20	4.4	455	100