A Work Project, presented as part of the requirements for the Award of a Master Degree in Finance from the NOVA - School of Business and Economics.

The Effect of Fund Size on Private Equity Buyout Fund Performance

Analysis of historical data of primarily European and North American private equity buyout funds for vintages 1995 to 2015, retrieved from Pitchbook

Disclosure of a self-conducted survey on the assessment of market beliefs about different fund sizes

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A Project carried out on the Master in Finance Program, under the supervision and assistance of Mr Fransisco Queiro. The Project is subject to the grade assessment by Professor Mr João Pereira.

I acknowledge gratefulness for the support and assistance to the above considered people, Moonfare GmbH who helped with retrieving the data and to every single person who contributed to my survey.

January 6, 2020

Abstract

Historical analyses surrounding the size effect on private equity buyout fund performance have arrived at controversial conclusions in regard to both the certainty of significance and, given significance, the outperformance of one size group over another. The paper uses performance data of 1,914 buyout funds spanning vintages 1995 to 2015, retrieved from Pitchbook, and summarizes a survey on investors' beliefs, conducted in Autumn 2019. No significance for fund size in absolute dollar terms can be found. However, when size is classified into quartiles and groups, 'Small' performs the best. This is robust for IRRs. Finally, investors tend to invest into smaller funds when the time horizon is longer, however, do not generally favor one specific size group.

Private Equity Buyout Fund Performance, Fund Size, Small vs Large-Cap, Fund Level Data

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

1. *Introduction*

Private equity (PE) is the largest asset class in private markets (McKinsey, 2018). A continued strong market performance in the past decades has led to massive increases in volumes, particularly in the buyout (BO) industry. High growth exposure and gigantic, robust historic returns have proven to give confidence to investors in the asset class (Pitchbook, 2010), resulting in record-breaking pools of capital among funds in the past years (Dompé and Ferri, 2019). For example, US PE fund raising went from $68bn in 2001 to $325bn in 2007 (Pitchbook) and to $561bn in 2017 (Drean, 2017). As of December 2018, the industry holds $4.5tn Assets under Management worldwide, whereas the number was only roughly $1tn in 2004 (Schelling, 2019). There are no signs of a slowdown in private markets, and it is likely that we see PE firms both raising funds even faster than before and going after even bigger funds (Schelling, 2019). Especially the recent two decades have shown strong commitment towards large deals. In 2006, Apollo raised the first fund over $10bn[1]. In 2007, GS Capital was the first fund with over $20bn[2]. In 2019, Blackstone surpassed the $26bn mark, setting a signal to exceed the $24.7bn fund raised in 2017 by Apollo and become the largest fund in history (Lewis, 2019). Given this, one might wonder whether an increasing fund size translates also into better performance.

According to Pitchbook, fund size is the total amount of capital committed by the limited partners (LPs) of the fund, the sum of investors' "capital commitments". It includes all of the fund's net capital and assets. In general, small funds tend to invest in smaller firms and large funds in mature, "sizeable" firms. Whereas smaller deals are characterized by value investing and organic growth creation (Wiggins, 2019), investors in larger deals, often large "household name" PE firms, have the resources, relationships and skills to not only manage the investments

1 Fund 'Apollo Investment Fund VI', closed at $10.14bn in 2006, is in the full data set with ID 10918-99F
2 Fund 'GS Capital VI', closed at $20.3bn in 2007, is in the full data set with ID 11488-69F

but also restructure the portfolio companies (Pitchbook, 2019). Schelling (2019) introduces the 'fund size discipline' which relies on the assumption that LPs want fund managers to remain consistent in their approach to the market, including the size of deals/ funds, in order to gain returns that are similar to the previous track record. Therefore, the definitions can be assumed to remain constant.

The prominence of mega funds is partly driven by the desire for consolidations of holdings by LPs with fewer, the 'best' GPs (McKinsey, 2017; Idzelis, 2019). In contrast to their smaller counterparts, GPs of larger funds face less competition on the market, have the ability to deploy large capital amounts and often can benefit from their connections and relationships (Auerbach, 2019). Whereas in a typical mid-market auction you see 30 bidders, mega deals valued at +$5bn have at maximum a handful of bidders. As marketing, branding and relation efforts become increasingly important in PE deals (Diorio, 2019), large GPs can more aggressively mark portfolio companies to market (Fernyhough and Carmean, 2019). Further, McKinsey (2017) concludes that LPs would be less likely to criticize large, experienced PE firms, which invest in large funds. On the contrary, the market has also experienced the beauty of small deals, especially in the 2000s. The deal flow in the lower and middle market was partly due to the great number of new arising PE firms that focused on smaller funds. 517 US firms contributed 12% to the total capital raised in the country in the ten years (Pitchbook, 2010). General Equity (2019) find that the trend towards smaller transactions is to a great part ascribed to the increase in add-ons and minority deals. In this context, they also highlight that post-closing issues are more complex for large firms and therefore, smaller firms are easier to handle. Further, BO shops are increasingly undergoing smaller transactions to minimize pitfalls that could arise from larger deals. Especially in today's investment world, fears about a new recession or tougher financing conditions make GPs hesitant to make billion-dollar deals (Wiggins, 2019). BO deals of below $500m were on record last year, taking 30% of the total industry's deal making

volume. But is that all? No. We see PE firms building up dry powder rates because it is becoming increasingly difficult to make deals in general, especially larger deals, due to a shortage of opportunities in the market as well as rising competition among PE firms and strategic buyers (Reck, 2019). Thus, as capital does not stop to flow into the market and dry powder rates rise, managers face enormous pressure to make deals, which in turn can result in suboptimal selection of deals (Humphery-Jenner, 2011).

PE generally refers to the investment in private, not publicly traded, firms. BO deals are next to venture capital deals, the most common fund type and can be either private-to-private or public-to-private deals. These investors can take advantage of long-term horizon PE investments, aiming to benefit from the illiquidity premium that they gain in private markets. For the past, value creation in BOs was mostly driven by high debt levels and multiple arbitrages (Roberts and Naydenova, 2019). Today, because of the long-term approach that GPs follow as well as rising valuations, the value creation process is, apart from financial engineering tactics, known to increasingly emphasize 'hands-on' operations, strategies and improvements (Hinkel, 2009). By 'pooling' investment opportunities into one vehicle, investors can create great diversification advantages. Nevertheless, PE investments do not come without a cost. Especially because of its special fee structure (carry and management fees), industry critics question if the investment in the asset class is worth it, in other words, if the high cost pays out in the end for investors. Drawing conclusions on PE fund performance has been subject to much academic research. Because of the opacity and lack of quality data in private markets, no consensus view on the performance and performance drivers of PE funds has been found. The paper at hand does not try to call into question the outperformance of PE investments over public markets or other asset classes, but rather, makes a discussion on the question of which, if there is one, fund size can drive performance higher.

The major challenge of the paper is to appraise the impact of fund size on fund performance. The paper is structured in the following way. The next section provides an overview on some areas of research, especially on what has been found on PE performance and the fund size effect to date. Next, I present the data used from Pitchbook. To this point, I elaborate on the methodology of the study. Then I present the results of the regression analysis followed by the insights the survey output reveals, introducing some practical and future implications. Lastly, I conclude the paper with a summary of the key findings.

2. Fund Performance and Fund Size

Historical performance of PE remains uncertain and an academic and practitioner scrutiny. Whether the huge market growth is driven by a general belief of high performance, as Phalippou and Gottschalg (2009) argue, or by real generated alpha, is subject to discussion. However, in response to market growth, research and papers surrounding the performance and performance drivers of PE funds has expanded too. Generally, performance is measured by two parameters: The Internal Rate of Return (IRR) and the Investment Multiple, the Total Value over Paid-in Capital (TVPI). Whereas the IRR relies on the timing of the fund's cash flows, called and distributed capital, the TVPI compares the sum of all fund contributions to the sum of all fund distributions and the value of unrealized investments (against net of fees and carried interest). Normally, the performance metrics are used in tandem. While investors which are more focused on receiving money back quicker or have specific future requirements would look for investments with high IRRs, others who prioritize the generation of excess returns might care more about multiples (Cobalt, 2014). Notably, two funds can have very similar IRRs, but can have completely different Multiples. And vice versa. The less time it takes GPs to put investor capital to work, the higher the IRR will be. Later academic literature has also concentrated on establishing an accurate comparison of PE investments to public markets. Kaplan and Schoar

(2005) introduced the public market equivalent (PME), 'KS-PME', that allows investors to draw a comparison on the net return of the underlying PE investment to the equivalent investment in the market. The authors find a slight underperformance to the S&P 500 Index for US BO funds of vintages up to 1995. Similarly, Phalippou and Gottschalg (2009) also do not find a positive conclusion for BO funds. Having said this, Ljungqvist and Richardson (2003) find, in opposition, excess returns of 5 to 8% per annum compared to the S&P 500 Index when analysing 54 BO funds of vintages between 1981 and 1993. Robinson and Sensoy (2011) document an outperformance of around 2.5% over the market for vintages 1998 to 2005 (after including 'sequence number'). Similarly, Harris et al. (2014) find for BO funds with vintages 1993 to 2008 an outperformance over public markets of more than 3% annually, leading to a 20 to 27% outperformance over the total fund lifetime (mostly ten years).

In the context of studying fund performance, past literature has also soaked into the prevalence of the size effect among investment classes. In portfolio performance literature of mutual funds, it has been found that fund size has a significant effect on the returns earned (Chen et al., 2004; Yan, 2008). Tangjitprom (2014) discovers a quadratic relationship (not linear) between mutual fund size and performance. This suggests that there is an optimal size for relatively small funds and that the performance increases as fund size increases, however, given it stays within the small fund size segment. This phenomenon can be explained by size advantages from economies of scale. Cumming and Dai (2011) also report economies of scale for small-sized funds. They focus on the venture capital market and show a convex (U-shaped) relationship between fund size and the ventures' performance, measured as the probability of successful exists. The results suggest that when funds are larger, performance decreases with size due to diseconomies of scale (Cumming and Dai, 2011; Tangjitprom, 2014). When the fund size is too large, managers become less able to manage funds effectively and instead of diversifying investments, they focus on scaling up current fund allocations (Tangjitprom, 2014).

Diseconomies of scale are also partly driven by constraints of quality and quantity of human capital (Cumming and Dai, 2011). A potential 'limited attention' spent on portfolio companies by fund managers caused by growing fund size, can reduce the performance (Cumming and Dai, 2011). Teo (2009) documents a negative and convex relationship between hedge fund size and returns. Small hedge funds outperform large hedge funds by 3.65% per year due to diseconomies of scale, specifically price impacts, hierarchy costs and capacity constraints. Humphery-Jenner (2011) studies the effect of fund size on PE BO funds and examines why large PE funds earn lower returns. He argues that large funds are suited to invest in large firms and the opposite holds true for small funds. However, large funds can make suboptimal allocations of capital and invest in small firms that lead to a lower performance compared to when small funds invest in small firms. Because small funds face capital constraints and therefore, can only invest in small firms, they do not face the problematic of suboptimal capital allocations. Talking about capital constraints, there is a continuing debate about whether there is too much money in the industry. Dry power rates have put pressure on managers, resulting in insufficient capital allocations (McKinsey, 2019). The earlier introduced 'fund size discipline' (Schelling, 2019) underlines the problematic of pressures to invest not only more but also faster. Looking at examples of PE firms that increased their fund size in subsequent funds, he finds that IRRs decrease with size. Kaplan and Schoar (2005) identify only a strong positive relation between size and performance for venture capital funds, and not for BO funds. Harris et al. (2014) also find no significant relationship between fund size and returns for BO funds at all. For venture capital funds the findings of Kaplan and Schoar (2005) ascertain a concave relation between size and performance, therefore, smaller funds and bottom quartile (fund size) funds underperform larger funds at the fund level. In the Gottschalg et al. (2015) study on the drivers of risk and return in PE funds, the authors identify substantial differences in the average performance of funds from different fund size categories. They analyse investors'

target fund sizes within the decision-making process of 771 mature European and North American BO funds retrieved from Preqin and conclude that in particular small-caps, and mid-caps, substantially and consistently perform better than large-caps. The inverse relationship however resists only given that investors have access to above-average performing PE funds ('selection ability'). If managers have no corresponding resources and/ or selection skills, then a portfolio of a few large funds is superior to a diversified small/mid cap fund in terms of average return. In line with Segal (2019), the authors also conclude that returns of small caps are more dispersed and therefore riskier than large caps. Further, small BO funds are more profitable but face greater risk and more fluctuations in terms of capital inflows and outflows.

3. Data and Descriptive Statistics

All fund performance data that is analysed in this study has been retrieved from Pitchbook. Pitchbook is a research firm providing PE and venture capital industry data, at deal and fund level, of over 46,900 funds, 6,600 LPs and 850,000 performance lines. The paper is different as most previous studies on fund performance and fund size retrieve their data from other private market data providers (Appendix I). Discrepancies among the private data universe are not uncommon and so are incompleteness and inconsistency. Higson and Stucke (2012) shed elaborate on different data sources previously used, arguing that the data from Thomson VentureXPert (TVE), being used in the studies of Kaplan and Schoar (2005) and Phalippou and Gottschalg (2009), is downward biased. The authors introduce a combination of data from Cambridge Associates (CA) and from a number of LPs. Using data from LPs is an alternative to data platforms. Pitchbook is a relatively young data provider but covers a great number of BO funds from the last three decades which is sufficient enough for the time horizon focus of the paper, vintages 1995 to 2015, and which also brings in a new data source to existing literature. The vintage year, as defined by Pitchbook, refers to the year of the initial closing of

the fund or, if stated differently, the year disclosed by the GP. Sometimes vintages also refer to the year when the first draw down of LP capital for investment purposes occurs, as for example used by Preqin. Preqin is also a relatively young data provider. Discrepancies in IRR performance could be due to discrepancies in vintages as it affects the time investors take to put capital to work. Normally, the longer it takes investors to invest capital, the lower the IRR. From Pitchbook I am able to gauge fund performance data of 2,039 funds. I exclude funds from the data set that have neither a disclosed IRR nor TVPI, resulting in 1,914 funds (1,538 funds which have a disclosed IRR and 1,720 funds with a disclosed TVPI). The funds are totalling to a fund size volume of $2,218bn. Table I shows the distribution of number of funds and of fund size volume among vintages and size classification. Notably, 2006 to 2008 has been very strong in terms of fund volume being raised among all sizes. The three vintages with 469 funds alone contribute 32% to the total volume. However, both performance measures IRR and TVPI have been lower during the years with the sample's second lowest IRR mean of 8.30% (lowest in 1998 with 7.08%) and a mean Multiple of 1.51x in 2006 (Multiple has only been lower in last three sample vintages 2013 to 2015). The IRR mean reaches its maximum of 27.35% in 2003. The average TVPI peaks in 2001 at 2.23x and the all-time low is in 2015 at 1.31x. A glance at the development of the performance measures over the sample period shows that the Multiple and IRR tends to decrease over time (total CAGR of -1.93%) whereas the IRR shows almost no growth (total CAGR of 0.03%). Reducing the sample to only liquidated funds (264), the average IRR and average TVPI in 2003 are 40.58% and 2.23x respectively. Generally, both performance measures tend to be higher if only considering liquidated funds (Appendix IV) thus, all conclusions drawn on the Full Data Set must be analysed with carefulness. When looking at the mean IRRs and TVPIs among the six size groups over all vintages, 'Small' seems to have the highest averages and 'Mid to Small' the lowest (Table III). When only differentiating between 'Small' funds (up to $499m) and 'Large' funds (>$499m), the TVPI

values among the two groups follow a very similar pattern with the smaller group (Quartiles 1 and 2) performing little better, especially during 1999 and 2005. The IRR averages for the larger funds (Quartiles 3 and 4) are only higher in the years 1995, 2001, 2002 and 2015. When comparing the averages among quartiles, then the TVPI values show lower variation among the sizes. Overall, it seems that Quartile 1 has the highest TVPI means. It is worth mentioning that 'Mega' funds represent only 5% of the total number of funds, of which 11 are reported for vintages between 1995 and 2004, and a total of 79 in the years following until 2015. The 89 'Mega' funds contribute to almost 35% of the total fund size volume. 24% of the funds are 'Large' funds, contributing 44% to the fund size volume and therefore, represent the biggest size group according to both volume and absolute fund number. 19% are 'Mid to Large' and 22% are 'Mid' funds. 12% of the sample are 'Small' funds, however the size class represents only 0.50% of the fund size volume. The disproportionate share of capital is not surprising and highlights the size differences among funds. McKinsey (2017) finds that mega and large funds have absorbed approximately 8% and 35% of total fund size volume in 2010 whereas it increased to more than 20% and almost 40% in 2016. This highlights the increase in fund size over time.

Table I Fund Volume and Fund Count Among Vintages and Size Category

The tables summarize the fund size volume (sum of fund size) and the number of funds being raised in the respective sample vintage (Full Data Set, Reduced Data Set). Some vintages do not have a fund. The bottom and the right show the totals.

Full Data Set: Fund Size Volume (in $M) and #Funds

	MEGA				LARGE				MID TO LARGE				MID				MID TO SMALL				SMALL				TOTAL			
	Volume (in $M)		#Funds		Volume (in $M)		#Funds		Volume (in $M)		#Funds		Volume (in $M)		#Funds		Volume (in $M)		#Funds		Volume (in $M)		#Funds		Volume (in $M)		#Funds	
1995	-	-	-	-	4,650.00	1%	3	3%	2193.59	0%	4	1%	3,881.46	2%	12	3%	499.00	0%	3	1%	514.59	1%	12	3%	11,738.64	1%	34	2%
1996	-	-	-	-	11,332.15	1%	7	8%	5178.57	1%	8	2%	4,110.05	2%	11	3%	2,237.99	2%	14	3%	503.03	1%	9	3%	23,361.79	1%	49	3%
1997	6,012.00	1%	1	1%	32,248.68	4%	14	16%	8104.03	1%	11	2%	3,042.10	1%	8	2%	2,776.40	2%	16	4%	444.47	1%	10	3%	52,627.68	2%	60	3%
1998	5,000.00	1%	1	1%	25,976.34	3%	12	13%	15409.09	2%	21	5%	5,577.30	2%	16	4%	3,105.85	2%	18	4%	314.57	1%	7	2%	55,383.15	2%	75	4%
1999	-	-	-	-	35,242.79	5%	18	20%	9826.71	1%	14	3%	6,171.50	2%	16	4%	2,774.10	2%	15	4%	568.37	1%	11	3%	54,583.47	2%	74	4%
2000	16,750.00	2%	3	3%	58,276.54	8%	26	29%	8158.84	1%	12	3%	6,348.20	3%	18	5%	2,383.24	2%	16	4%	785.71	1%	16	5%	92,702.53	4%	91	5%
2001	5,340.00	1%	1	1%	36,960.16	5%	16	18%	5854.89	1%	9	2%	3,340.05	1%	9	2%	2,425.59	2%	14	3%	460.31	1%	10	3%	54,381.00	2%	59	3%
2002	11,400.00	1%	2	2%	24,378.16	3%	12	13%	8228.5	1%	12	3%	3,468.35	1%	10	3%	1,418.48	1%	10	2%	526.24	1%	9	3%	49,419.73	2%	55	3%
2003	11,854.87	2%	2	2%	19,173.45	2%	9	10%	5799.09	1%	9	2%	2,913.92	1%	9	2%	1,866.34	1%	11	3%	722.92	1%	16	5%	42,330.59	2%	56	3%
2004	5,800.00	1%	1	1%	33,027.54	4%	15	17%	11471.69	1%	16	3%	5,043.35	2%	14	4%	2,933.41	2%	17	4%	316.55	1%	7	2%	58,592.54	3%	70	4%
2005	58,005.22	8%	8	9%	67,871.03	9%	33	37%	12963.45	1%	19	4%	10,950.39	4%	33	9%	3,439.65	2%	21	5%	483.32	1%	12	3%	153,713.06	7%	126	7%
2006	148,041.67	19%	15	17%	65,472.77	9%	32	36%	22237.9	2%	32	7%	15,959.87	6%	45	12%	4,326.22	3%	26	6%	508.98	1%	11	3%	256,547.41	12%	161	8%
2007	119,235.24	16%	12	13%	78,239.47	10%	42	47%	17707.17	2%	26	6%	14,298.31	6%	41	11%	6,196.01	4%	35	8%	937.17	2%	19	5%	236,613.37	11%	175	9%
2008	100,684.04	13%	10	11%	88,748.48	12%	41	46%	15619.89	2%	24	5%	8,873.17	4%	25	7%	2,712.58	2%	16	4%	953.56	2%	17	5%	217,591.72	10%	133	7%
2009	10,243.58	1%	2	2%	32,199.25	4%	14	16%	8464.04	1%	12	3%	4,564.80	2%	12	3%	2,563.55	2%	14	3%	381.41	1%	7	2%	58,416.63	3%	61	3%
2010	-	-	-	-	25,153.73	3%	14	16%	14867.85	2%	21	5%	5,631.85	2%	16	4%	3,202.06	2%	18	4%	225.20	0%	6	2%	49,080.69	2%	75	4%
2011	41,865.76	5%	4	4%	43,702.70	6%	21	24%	14043.86	1%	21	5%	9,227.27	4%	26	7%	1,892.93	1%	9	2%	480.46	1%	12	3%	111,212.98	5%	93	5%
2012	67,444.34	9%	8	9%	55,180.05	7%	26	29%	23020.05	2%	32	7%	9,209.12	4%	26	7%	3,684.24	2%	19	5%	682.07	1%	14	4%	159,219.87	7%	125	7%
2013	54,469.52	7%	6	7%	70,994.78	9%	29	33%	12971.64	1%	19	4%	9,047.48	4%	26	7%	3,516.31	2%	22	5%	202.78	0%	7	2%	151,202.51	7%	109	6%
2014	57,373.78	7%	7	8%	64,045.77	8%	29	33%	14324.1	1%	21	5%	8,316.40	3%	22	6%	2,942.08	2%	18	4%	521.89	1%	9	3%	147,524.02	7%	106	6%
2015	48,595.75	6%	6	7%	104,990.32	14%	48	54%	15322.57	2%	20	4%	9,162.57	4%	27	7%	2,772.75	2%	15	4%	537.11	1%	11	3%	181,381.07	8%	127	7%
MEAN	45,183.28		5		46,564.96		22		11,988.93		17		7,101.79		20		2,841.37		17		527.18		11		105,601.16		91	
MEDIAN	41,865.76		4		36,960.16		18		12,963.45		19		6,171.50		16		2,774.10		16		508.98		11		58,592.54		75	
TOTAL	768,115.77	35%	89	5%	977,864.16	44%	461	24%	251,767.52	11%	363	19%	149,137.51	7%	422	22%	59,668.78	3%	347	18%	11,070.71	0%	232	12%	2,217,624.45		1,914	

Table II Fund Volume and Average Fund Performance Per Vintage

Graph 1 shows the sum of fund size volume and average performance measured by TVPI (in x) per vintage. Graph 2 does the same with performance measured by IRR (in %). Notably, the volume increases steadily whereas the average TVPI decreases and the average IRR shows little

grow. The graphs for the Reduced Data Set are not robust enough to show as there are for a few vintages only one fund in the data set.

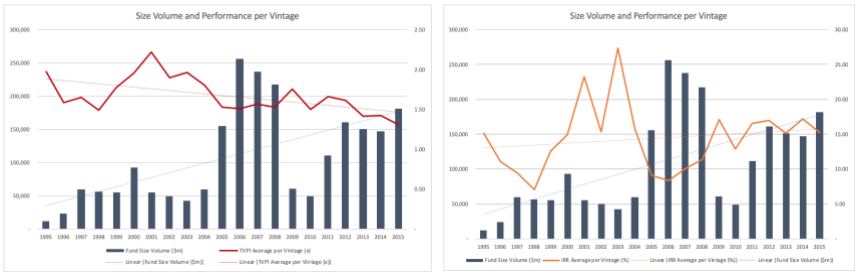
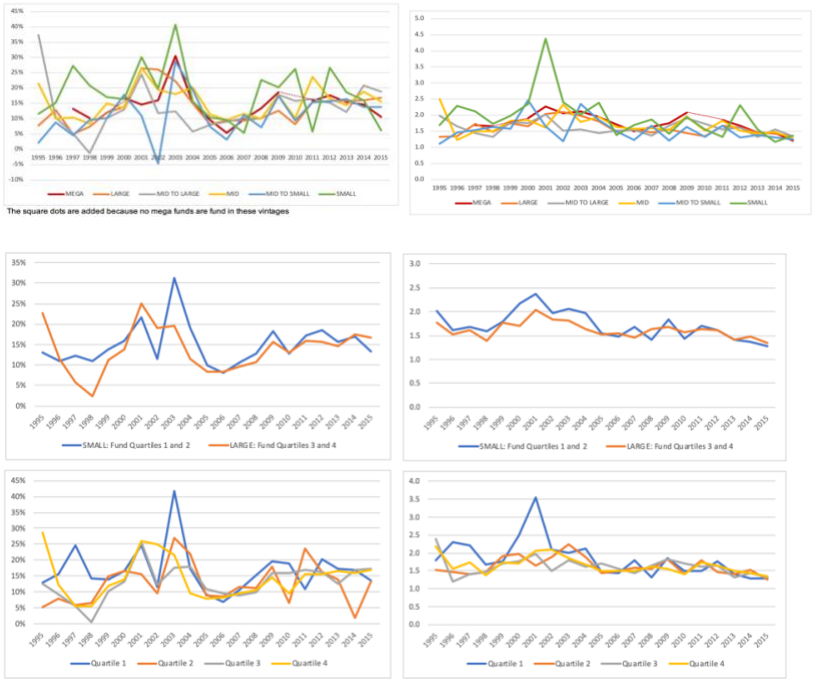


Table III Performance Averages Among the Six Size Categories, Among Fund Quartiles, and Among Two Size Groups Per Vintage

The graphs show performance averages, IRR (%) and TVPI (x), summarized by three different size groups: 1. The differentiation between 'Mega', 'Large', 'Mid to Large', 'Mid', 'Mid to Small', and 'Small' funds; 2. The differentiation between two size groups, 'Large' (Q3 and Q4 or 'Mega', 'Large', and 'Mid to Large') and 'Small' (Q1 and Q2 or 'Mid', 'Mid to Small', and 'Small')



The largest GP in the sample is the Carlyle Group ($79.4bn) followed by KKR ($73.4bn). TPG Capital and the Blackstone Group are the next two largest investors according to fund size volume (Appendix VI). Appendix VI lists all funds in the sample being raised by the four mentioned GPs. The majority of the funds are either 'Large' or 'Mega' funds. Appendix V shows the 20 best and worst performing funds of all liquidated funds in the data set according to TVPI and IRR. A similar trend can be recognized. Of both the best and worst performing

funds, 25% to 30% are ‘Small’ funds whereas 10% are ‘Large’ funds and none is a ‘Mega’ fund (both Multiple and IRR). On the strength of the best performing funds, one would at least get some feeling to believe that smaller funds outperform larger funds. However, this assumption would be flawed as no risk parameter is taken into consideration. Further, the smaller-sized segment also absorbs the highest proportion of worst performing funds, giving rise to the higher uncertainty involved in this size group. The paper does not make a risk assessment on the fund size groups. However, Table IV summarizes the dispersion among the size groups, highlighting the dispersion by darker colors. From the table one can somehow conclude that the return for an investment in a ‘Small’ fund is less certain. Among all size groups, small funds overall show the highest dispersion, which holds true for both TVPI and IRR. Whereas ‘Mega’ funds have an average IRR dispersion of 0.28 percentage points in the sample, for ‘Small’ funds the dispersion is 2.17 percentage points. For TVPI it is 1.92 and 5.61 percentage points respectively. This observation is widely accepted and is not surprising. Dompé and Ferri (2019) find that SMBO (small to mid BOs) performance is more dispersed than LMBO (large to mega BOs).

Table IV IRR and TVPI Dispersion in the Full Data Set

The tables display the dispersion among size group and vintage. The dispersion is calculated by taking the maximum performance value (TVPI and IRR respectively) and subtracting the minimum performance value. The colors highlight where the dispersion is the highest, in particular, among smaller-sized funds.

TVPI Dispersion

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Mega			0	0		0.37	0	0.67	0.78	0	1.45	1.92	1.07	0.75	1.44		1.22	0.6	0.54	0.87	0.41	1.92
Large	0.21	0.49	2.24	1.7	3.42	1.81	2.86	1.77	1.85	2.02	1.88	1.41	2.42	2.29	2.94	1.8	2.22	1.22	1.88	1.35	1.4	3.21
Mid to Large	1.43	1.5	1.29	2.56	2.32	2.64	1.49	1.38	1.4	2.65	2.79	2.84	2.37	4.2	1.75	1.39	2.77	2.51	1.22	2.39	1.47	2.98
Mid	4.79	2.42	1.69	3.07	1.95	3.54	2.15	2.82	2.16	2.58	6.77	3.01	2.52	1.87	2.14	1.74	4.18	1.39	2.21	1.88	0.75	6.02
Mid to Small	0.93	1.64	3.98	2.66	1.72	2.05	2.07	1.99	1.34	3.53	2.23	3.05	2.66	2.08	1.1	2.62	2.55	1.9	1.57	1.41	0.97	3.05
Small	4.01	5.23	4.15	2.64	3.93	2.73	6.27	3.62	3.12	5.69	2.56	2	6.71	2.43	2.18	2.81	3.5	4.12	1.1	1.12	2.76	5.61
Total	4.58	4.74	4.15	3.07	2.21	3.17	6.27	2.95	2.34	5.69	5.32	1.64	5.64	3.45	1.84	1.42	2.96	3.52	1.67	1.52	2.35	4.85

IRR Dispersion

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Mega			0	0		0.062	0	0	0.1102	0	0.2056	0.2336	0.1575	0.1955	0.159		0.1449	0.1224	0.0916	0.282	0.244	0.282
Large	0.0484	0.2893	0.5708	0.2487	0.3836	0.4119	0.4814	0.3656	0.2693	0.5722	0.7982	0.2255	0.363	0.44	0.5015	0.5801	0.4074	0.3516	0.4308	0.353	0.3825	0.751
Mid to Large	0.3546	0.2308	0.1734	1.2298	0.5585	0.4137	0.3658	0.4237	0.4504	1.0162	0.2562	0.4433	0.207	1.43	0.3166	0.272	0.3151	0.565	0.5549	0.7337	0.4719	1.257
Mid	0.8545	0.3964	0.3203	0.4524	0.288	0.538	0.9175	0.2345	0.374	0.938	0.7408	0.582	0.445	0.4732	0.308	0.6102	1.079	0.3279	0.6359	0.5526	0.8253	0.845
Mid to Small	0.2414	0.3106	0.4956	0.6951	0.292	0.6201	0.5495	0.6923	0.5433	0.5922	0.3867	0.608	0.5274	0.385	0.35	0.5182	0.266	0.903	0.498	0.678	0.314	0.662
Small	1.5784	0.966	0.9608	0.5414	0.2563	0.404	0.882	0.8773	2.3986	0.425	0.495	0.3925	1.4472	0.789	0.6069	0.459	1.358	0.591	0.225	0.4573	1.2856	2.174
Total	1.53	0.7352	0.9608	1.2298	0.3022	0.5581	0.9175	0.8773	2.2684	1.0162	0.5936	0.3825	1.2897	1.2345	0.4479	0.3382	1.2131	0.7806	0.5443	0.4517	1.0416	

If it shows blank, then no funds for this size category and vintage are in the dataset
If it shows 0, then either only one fund for this size category and vintage are in the data set or have a disclosed IRR or TVPI

I randomly analyse the impact of size on the fund performance and do not specifically compare the performance of the first fund raised by one PE firm to its follow-up funds. Schelling (2019) however does so and argues that performance decreases in the subsequent funds due to an

observable higher fund size. Randomly selecting nine groups of funds (three to four funds) among the liquidated funds in the sample, I find that fund size consistently increases over time while most IRR and TVPI parameters show a downward sloping trend (Appendix VIII). Anyway, no robust conclusion can be drawn on these observations and therefore represent a future research area. It would be interesting to account for the impact that fund managers (PE firms) have on the fund performance by looking in depth on specific firms and its funds. The survey results confirm that fund managers play an important role in selecting an investment.

4. Methodology

In the study, I run various regression analyses in order to assess the statistical significance of fund size on fund performance, measured by IRR and TVPI. In order to make the definition of size more robust, I include different size variables, in particular, I choose four different fund size variables: 1) the absolute fund size (in US dollars), 2) the fund size quartile per vintage (based on the total data set of 1,914 funds), 3) the classification into one of the six size groups (Appendix II: 'Small', 'Mid to Small', 'Mid', 'Mid to Large', 'Large', 'Mega') and 4) the classification into either the 'Small' (up to $499m or Quartiles 1 and 2) or 'Large' group (>$499m). Notably, I do not have to choose different cut-off brackets for size categories in order to adjust for increasing sizes in all size groups over time. The cut-offs of the six size classifications (4) are consistent among the entire time period. Still, the second variable incorporates variations among years instead of the total time period. Further, I include a vintage dummy that captures economic booms and busts such as the dot-com bubble and the financial crisis. With the vintage dummy, I am able to control for years which generally had a negative impact on markets. I create a dummy variable, 'Vintage Bubble' (=1), for all funds with vintages: 1999-2000, and 2008-2009. Throughout the paper, I include the two diversification measures. First, the funds' preferred industry reveals information about a fund's strategy as

well as plays an important role in the due diligence of investors, confirmed in the survey. As most funds are either European and/ or US focused, I create for both a dummy variable that indicates whether a fund has at least a partial focus on European and/ or North American (mainly US) investments. Further, I also include the 'count of regional focus' into the regression following the assumption that the more regional focuses a fund has, the more diversified it is ('diversification benefit'). I count countries and for the US the states. I do the same for the funds' industry focuses where I created groups and subgroups (Appendix IX). The model holds the assumption that the more broadly the focus (higher the count), the more diversified the investment in the fund. Apparently for both region and industry, I am only able to include funds for which I have information on the condition. Additionally, I include the source of disclosure into the regression. The fund data is provided by either GPs, LPs or by a mix of both. When GPs report the data ('GP Self Reporting'), then performance tends to be overstated (compared to 'LP Original Commitments'). Past literature has experienced the same. The problematic becomes especially present in the fund-raising stage for follow-up funds in which GPs try to "sell" their funds and strategically influence the reporting. Next, I shed light on the number of funds that have been raised by the investor prior to the funds' vintage. If the underlying fund is the first fund raised by the investor, then the number of prior funds equals zero. If there were more than one investor, than the dummy is equal to zero only if it holds true for both investors. First funds raised tend to be smaller as GPs are less experienced and as it tends to be harder for them to find capital and put it to work. Phalippou and Gottschalg (2009) advocate that performance increases with fund size, but that it returns are lower for first time funds. Kaplan and Schoar (2005) find that higher sequence number funds have higher returns but also that when a GP raises a subsequent fund, then its return declines (however not statistically significant). Furthermore, I run the same regression with only mature funds. Because there does not exist a value for unrealized investments, it is important to look separately on liquidated

funds. With the liquidity condition in place, I summarize 264 observations with a total fund size volume of $148.1bn. Notably, the liquidity condition cuts out vintages 2012 to 2015 and apparently, size category “Mega” is also almost diminished from the data when the condition is applied (one ’Mega’ fund in 1997). The Reduced Data Set however also incorporates the regional count, which in the end deletes the ‘Mega’ fund as well as vintage 2011 and 2012 from the sample. Lastly, I pick funds of two specifically selected vintage periods. First, I reduce the sample to only funds with vintages 1998, 1999, 2000 and 2001. Table I shows the relatively high performance of funds in general during the years. In the years, the IRR average rose from 7.08% to 23.22% (CAGR 34.56%) whereas the TVPI increased from a vintage mean of 1.50x in 1998 to 2.23x in 2001 (CAGR 10.42%). Notably, the total fund size volume had a strong year in 2000 ($92.7bn) however, in the other years stayed around $55bn. As the paper does not focus on comparing the performance of the funds to any market indexes (e.g. S&P 500), it is however interesting to look for a pattern in size differences among strong as well as weak periods. The second period includes therefore the years 2006, 2007 and 2008. Fund commitments started already to rise from 2004 onwards. In 2006, the volume reaches its peak in the sample with $256.6bn, representing 11.6% of the total.

5. Results

In the regressions, the dependent variable, y, is always fund performance. Table VI shows the regression output for the Full and Reduced Data Set, where performance is measured by IRR and Appendix X shows the same analysis with performance measured by Multiple, TVPI. The Reduced Data Set includes only liquidated funds. In short, the tables reveal that the studied effect of fund size on fund performance is only significant when I include the ‘Fund Size Quartile per Vintage’ or the Fund Size Groups into the analysis. Apparently, no significance could be found for fund size in absolute dollar terms in all regressions (p-values above at least

above 0.55). That is also in line with what other studies have found. There is no linear relationship between size and performance, therefore performance neither consistently increases nor decreases with fund size. I explore if the 'Fund Size Quartile per Vintage' has a significant impact on performance measured by IRR. Notably, in the Full Data Set as well as in the Reduced Data Set, all Quartiles are significant at least at the 5% significance level. In the Full Data Set with 1,538 observations all Quartiles are significant at the 1% level and Q1 has the highest positive impact (0.152) on the dependent variable, IRR. In the Reduced Data Set, all Quartiles show a strong and positive impact on performance, whereas Q1 has the highest impact with a coefficient of 0.22. Overall, the Reduced Model is significant with a predictive power of 51%. Evidently all regressions (Full Data Set, Reduced Data Set and Selective Vintages see below) that I ran with the dependent variable, y, being the TVPI are not robust enough. Also, when taking the logarithm of TVPI, I am not able to get a sufficient output. I further took out some parameters in order to make the impact of one parameter stronger, put the validation did not improve. All regressions have a too high standard error in order to make the models valid. Therefore, I cannot make a conclusion on what the size impact is on the TVPI. The regression outputs are included in the Appendix. Even though I did not need to adjust for size cut-off brackets, I ran some more analyses with selective vintages in order to minimize noise from variations among vintages and to find any patterns in strong and weak years. For the first sample (vintages 1998 to 2001 – strong performance) I find that Q1, Q2 and Q3 are significant for IRR performance and similar to other results, Q1 has the strongest impact (0.151). In particular, European funds are significant at the 1% level and increase performance by 7.7%. When size is measured by category, only 'Mid' and 'Small' funds are significant (1% level). 'Mid' sized funds have a positive coefficient, 0.12, and 'Small' funds' coefficient is 0.19. Further, European focused funds are significant too (p-value 0.00314) and increase performance by 8.6%. The findings are parallel to Wiggins (2019) and Gottschalg et al. (2015)

who find both an outperformance of European PE investments over the US. Gottschalg et al. study funds between vintages 1998 to 2007. 'GP Reporting funds' is significant at the 5% level only (p-value of 0.0495) only in the data set with vintages 1998, 1999, 2000 and 2001 where size is grouped into the six classifications. Approximately ¼ of the funds fulfill 'At least partly GP Reporting' which increases performance by 4.6%. There is no real explanation for this. It could support the view of Phalippou and Gottschalg (2009) who analyze fund data from 2003 and conclude that the huge market growth is driven by a belief of high performance, which in turn, could have been bolstered especially by GPs. Apparently, when only considering vintages 2006 to 2008, European funds are not significant which would suggest that during weaker performance in general, European funds do not perform better or at least cannot balance out the effect of weaker performance due to general fragile market conditions. One possible explanation for why the smaller funds show the highest positive coefficients could be the 'selection ability' (introduced by Humphery-Jenner, 2011) or it can also be the increased risk that comes with smaller funds (firms), and therefore, a higher gain for investors.

Table VI Full Data Set and Reduced Data Set IRR

The following tables present the excel regression outputs for the Full Data Set, Reduced Data Set and Selective Vintages (only pre-selected vintages) on a fund level. The dependent variable is always the IRR and the regressions include different fund size definitions (size, quartiles or size classification).

FULL IRR DATA SET SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.62967925
R Square	0.39649596
Adjusted R Square	0.39228683
Standard Error	0.17039327
Observations	1538

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	10	29.1465256	2.91465256	100.38803	1.04E-159
Residual	1528	44.3637466	0.02903387		
Total	1538	73.5102722			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Size	(0.0000004)	0.0000025	(0.1384332)	0.8899163	(0.0000053)	0.0000046	(0.0000053)	0.0000046
Vintages Bubble	(0.0031456)	0.0109510	(0.2872410)	0.7739668	(0.0246261)	0.0183349	(0.0246261)	0.0183349
Liquidated	0.0094585	0.0125409	0.7542092	0.4508398	(0.0151407)	0.0340576	(0.0151407)	0.0340576
Count of Prior Funds	(0.0003688)	0.0004031	(0.9149544)	0.3603599	(0.0011596)	0.0004219	(0.0011596)	0.0004219
First fund for at least one investor	(0.0045513)	0.0127674	(0.3564784)	0.7215315	(0.0295948)	0.0204922	(0.0295948)	0.0204922
At Least Partly GP Reporting	0.0142908	0.0100943	1.4157313	0.1570580	(0.0055093)	0.0340909	(0.0055093)	0.0340909
Q1	0.1520609	0.0111679	13.6159231	0.0000000	0.1301549	0.1739669	0.1301549	0.1739669
Q2	0.1344895	0.0098786	13.6142240	0.0000000	0.1151124	0.1538665	0.1151124	0.1538665
Q3	0.1253613	0.0098769	12.6923152	0.0000000	0.1059875	0.1447351	0.1059875	0.1447351
Q4	0.1334576	0.0126923	10.5148734	0.0000000	0.1085615	0.1583537	0.1085615	0.1583537

REDUCED IRR MODEL SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.71077311
R Square	0.50519841
Adjusted R Square	0.46467755
Standard Error	0.16458508
Observations	171

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	12	4.397531138	0.36646093	13.5284104	0.0000000
Residual	159	4.307031332	0.02708825		
Total	171	8.70456247			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Fund Size	(0.0000176)	0.0000301	(0.5855000)	0.5590416	(0.0000771)	0.0000418	(0.0000771)	0.0000418
Q1	0.2197836	0.0487432	4.5090142	0.0000126	0.1235161	0.3160512	0.1235161	0.3160512
Q2	0.1681069	0.0498520	3.3721206	0.0009367	0.0696494	0.2665644	0.0696494	0.2665644
Q3	0.1345336	0.0518598	2.5941815	0.0103675	0.0321108	0.2369564	0.0321108	0.2369564
Q4	0.1557643	0.0738578	2.1089750	0.0365135	0.0098954	0.3016332	0.0098954	0.3016332
Count of Geography Focus	0.0013584	0.0032418	0.4190372	0.6757545	(0.0050441)	0.0077610	(0.0050441)	0.0077610
Focus US (1 if yes)	(0.0467616)	0.0387125	(1.2079207)	0.2288714	(0.1232185)	0.0296954	(0.1232185)	0.0296954
Focus EU (1 if yes)	0.0711265	0.0398999	1.7826228	0.0765559	(0.0076757)	0.1499287	(0.0076757)	0.1499287
At Least Partly GP Reporting	0.0041856	0.0322347	0.1298471	0.8968515	(0.0594779)	0.0678490	(0.0594779)	0.0678490
Count of Prior Funds	(0.0041124)	0.0039902	(1.0306447)	0.3042727	(0.0119930)	0.0037681	(0.0119930)	0.0037681
Count of Industry Focus	0.0078242	0.0110198	0.7100176	0.4787333	(0.0139398)	0.0295883	(0.0139398)	0.0295883
Vintages Bubble (1999,2000,2008,2009)	(0.0178780)	0.0298043	(0.5998452)	0.5494633	(0.0767414)	0.0409854	(0.0767414)	0.0409854

REDUCED IRR MODEL SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.72587545
R Square	0.52689517
Adjusted R Square	0.48463405
Standard Error	0.16144464
Observations	171

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	13	4.58639195	0.35279938	13.5356955	0.0000000
Residual	158	4.11817052	0.02606437		
Total	171	8.70456247			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Fund Size	(0.0000002)	0.0000319	(0.0077401)	0.9938341	(0.0000634)	0.0000629	(0.0000634)	0.0000629
Large	0.1246395	0.0805607	1.5471491	0.1238280	(0.0344754)	0.2837543	(0.0344754)	0.2837543
Mid To Large	0.0810497	0.0568895	1.4246866	0.1562200	(0.0313123)	0.1934117	(0.0313123)	0.1934117
Mid	0.1669151	0.0506468	3.2956696	0.0012124	0.0668830	0.2669472	0.0668830	0.2669472
Mid to Small	0.1750596	0.0489533	3.5760553	0.0004632	0.0783724	0.2717468	0.0783724	0.2717468
Small	0.2489475	0.0505981	4.9200915	0.0000022	0.1490115	0.3488835	0.1490115	0.3488835
Count of Geography Focus	0.0010324	0.0031873	0.3239252	0.7464230	(0.0052628)	0.0073277	(0.0052628)	0.0073277
Focus US (1 if yes)	(0.0478605)	0.0379417	(1.2614219)	0.2090161	(0.1227989)	0.0270779	(0.1227989)	0.0270779
Focus EU (1 if yes)	0.0792859	0.0396740	1.9984364	0.0473848	0.0009262	0.1576456	0.0009262	0.1576456
At Least Partly GP Reporting	(0.0018306)	0.0316767	(0.0577897)	0.9539892	(0.0643950)	0.0607339	(0.0643950)	0.0607339
Count of Prior Funds	(0.0048282)	0.0039571	(1.2201383)	0.2242304	(0.0126438)	0.0029874	(0.0126438)	0.0029874
Count of Industry Focus	0.0061126	0.0110489	0.5532372	0.5808829	(0.0157099)	0.0279352	(0.0157099)	0.0279352
Vintages Bubble (1999,2000,2008,2009)	(0.0105051)	0.0292042	(0.3597114)	0.7195433	(0.0681860)	0.0471758	(0.0681860)	0.0471758

IRR SUMMARY OUTPUT for Vintages 1998, 1999, 2000, 2001

Regression Statistics	
Multiple R	0.72866637
R Square	0.53095468
Adjusted R Square	0.49747719
Standard Error	0.14473589
Observations	211

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	13	4.695267361	0.36117441	17.2410807	0.0000000
Residual	198	4.147798789	0.02094848		
Total	211	8.84306615			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Fund Size	0.0000142	0.0000148	0.9603218	0.3380645	(0.0000150)	0.0000435	(0.0000150)	0.0000435
Count of Geography Focus	0.0005857	0.0035784	0.1636672	0.8701601	(0.0064711)	0.0076424	(0.0064711)	0.0076424
Focus EU (1 if yes)	0.0766051	0.0293561	2.6095125	0.0097597	0.0187144	0.1344958	0.0187144	0.1344958
Q1	0.1509666	0.0426625	3.5386247	0.0005011	0.0668354	0.2350978	0.0668354	0.2350978
Q2	0.1114069	0.0406957	2.7375571	0.0067535	0.0311542	0.1916595	0.0311542	0.1916595
Q3	0.1090480	0.0407391	2.6767409	0.0080575	0.0287098	0.1893861	0.0287098	0.1893861
Q4	0.0649737	0.0508916	1.2767084	0.2032005	(0.0353854)	0.1653329	(0.0353854)	0.1653329
Count Industry Focus	0.0080676	0.0103232	0.7815086	0.4354369	(0.0122898)	0.0284251	(0.0122898)	0.0284251
First Fund For At Least One Investor	0.0102263	0.0268829	0.3804029	0.7040541	(0.0427873)	0.0632399	(0.0427873)	0.0632399
At Least Partly GP Reporting	0.0419567	0.0237920	1.7634782	0.0793623	(0.0049616)	0.0888750	(0.0049616)	0.0888750
Focus US (1 if yes)	(0.0278329)	0.0291366	(0.9552545)	0.3406138	(0.0852909)	0.0296251	(0.0852909)	0.0296251
Count of Prior Funds	0.0018573	0.0029637	0.6267031	0.5315758	(0.0039871)	0.0077018	(0.0039871)	0.0077018
Liquidation Dummy (1 if yes)	(0.0237159)	0.0214931	(1.1034194)	0.2711843	(0.0661007)	0.0186689	(0.0661007)	0.0186689

IRR SUMMARY OUTPUT for Vintages 1998, 1999, 2000, 2001

Regression Statistics	
Multiple R	0.74569865
R Square	0.55606648
Adjusted R Square	0.5192549
Standard Error	0.14152474
Observations	211

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	15	4.917332637	0.32782218	16.3671697	0.0000000
Residual	196	3.925733513	0.02002925		
Total	211	8.84306615			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Fund Size	2.4217E-05	1.75365E-05	1.3809412	0.16886957	-1.037E-05	5.8801E-05	-1.037E-05	5.8801E-05
Count of Geography Focus	0.00164969	0.003557473	0.46372598	0.64335866	-0.0053661	0.00866553	-0.0053661	0.00866553
Focus EU (1 if yes)	0.08595216	0.028739559	2.99072659	0.00314021	0.02927369	0.14263063	0.02927369	0.14263063
Mega	-0.0741291	0.129430191	-0.5727345	0.56748091	-0.3293837	0.18112548	-0.3293837	0.18112548
Large	0.02739907	0.057974446	0.47260596	0.63702015	-0.0869347	0.14173286	-0.0869347	0.14173286
Mid to Large	0.06802752	0.043175061	1.57562066	0.11672595	-0.0171198	0.15317483	-0.0171198	0.15317483
Mid	0.12258551	0.041858552	2.92856555	0.00380869	0.04003454	0.20513649	0.04003454	0.20513649
Mid To Small	0.07035202	0.042247904	1.6652193	0.09746661	-0.0129668	0.15367086	-0.0129668	0.15367086
Small	0.19313552	0.04687838	4.11992732	5.5877E-05	0.10068473	0.28558631	0.10068473	0.28558631
Count Industry Focus	0.0115563	0.010141625	1.1394918	0.25588875	-0.0084444	0.03155702	-0.0084444	0.03155702
First Fund For At Least One Investor	0.01526714	0.027145138	0.56242639	0.57446823	-0.0382669	0.06880119	-0.0382669	0.06880119
At Least Partly GP Reporting	0.04603224	0.023290299	1.97645554	0.04950578	0.00010048	0.091964	0.00010048	0.091964
Focus US (1 if yes)	-0.0219591	0.028570191	-0.7686002	0.44305579	-0.0783035	0.0343854	-0.0783035	0.0343854
Count of Prior Funds	0.00250116	0.002929423	0.85380716	0.39425413	-0.0032761	0.0082784	-0.0032761	0.0082784
Liquidation Dummy (1 if yes)	-0.0267293	0.021090887	-1.2673379	0.20653815	-0.0683235	0.01486493	-0.0683235	0.01486493

IRR SUMMARY OUTPUT for Vintages 2006, 2007, 2008

Regression Statistics	
Multiple R	0.73029383
R Square	0.53332907
Adjusted R Square	0.50967298
Standard Error	0.10948172
Observations	292

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	13	3.821834882	0.2939873	24.5270528	0.0000000
Residual	279	3.344162748	0.01198625		
Total	292	7.16599763			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Fund Size	0.0000005	0.0000027	0.1896657	0.8497090	(0.0000047)	0.0000057	(0.0000047)	0.0000057
Count of Geography Focus	(0.0002712)	0.0009671	(0.2804009)	0.7793778	(0.0021750)	0.0016326	(0.0021750)	0.0016326
Focus EU (1 if yes)	(0.0190942)	0.0162713	(1.1734841)	0.2416025	(0.0511244)	0.0129360	(0.0511244)	0.0129360
First fund for at least one investor	0.0104507	0.0202599	0.5158335	0.6063792	(0.0294309)	0.0503323	(0.0294309)	0.0503323
At Least Partly GP Reporting	0.0020470	0.0151765	0.1348776	0.8928059	(0.0278281)	0.0319220	(0.0278281)	0.0319220
Focus US (1 if yes)	0.0199980	0.0147888	1.3522411	0.1773933	(0.0091138)	0.0491099	(0.0091138)	0.0491099
Count of Industry Focus	0.0046762	0.0061693	0.7579737	0.4491065	(0.0074681)	0.0168204	(0.0074681)	0.0168204
Count of Prior Funds	(0.0001747)	0.0006418	(0.2722694)	0.7856162	(0.0014382)	0.0010887	(0.0014382)	0.0010887
Liquidated	0.0298348	0.0405015	0.7366351	0.4619633	(0.0498925)	0.1095621	(0.0498925)	0.1095621
Q1	0.1056188	0.0222504	4.7468241	0.0000033	0.0618188	0.1494188	0.0618188	0.1494188
Q2	0.1013271	0.0208368	4.8628850	0.0000019	0.0603098	0.1423445	0.0603098	0.1423445
Q3	0.0961044	0.0206012	4.6649925	0.0000048	0.0555509	0.1366579	0.0555509	0.1366579
Q4	0.0905106	0.0242723	3.7289623	0.0002328	0.0427304	0.1382908	0.0427304	0.1382908

IRR SUMMARY OUTPUT for Vintages 2006, 2007, 2008

Regression Statistics	
Multiple R	0.7473396
R Square	0.55851648
Adjusted R Square	0.5324992
Standard Error	0.10626653
Observations	291

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	15	3.942970847	0.26286472	23.2776595	0.0000000
Residual	276	3.116750783	0.01129258		
Total	291	7.05972163			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Fund Size	0.0000028	0.0000040	0.7057198	0.4809577	(0.0000050)	0.0000107	(0.0000050)	0.0000107
Count of Geography Focus	(0.0001506)	0.0009399	(0.1602219)	0.8728234	(0.0020008)	0.0016996	(0.0020008)	0.0016996
Focus EU (1 if yes)	(0.0152857)	0.0159619	(0.9576359)	0.3390845	(0.0467083)	0.0161369	(0.0467083)	0.0161369
First fund for at least one investor	0.0023963	0.0199526	0.1200991	0.9044920	(0.0368824)	0.0416750	(0.0368824)	0.0416750
At Least Partly GP Reporting	(0.0043493)	0.0148631	(0.2926246)	0.7700290	(0.0336087)	0.0249101	(0.0336087)	0.0249101
Focus US (1 if yes)	0.0299124	0.0145809	2.0514790	0.0411640	0.0012085	0.0586163	0.0012085	0.0586163
Count of Industry Focus	0.0032294	0.0059629	0.5415869	0.5885400	(0.0085091)	0.0149680	(0.0085091)	0.0149680
Count of Prior Funds	(0.0001479)	0.0006245	(0.2368165)	0.8129748	(0.0013772)	0.0010814	(0.0013772)	0.0010814
Liquidated	0.0265670	0.0392323	0.6771731	0.4988633	(0.0506655)	0.1037996	(0.0506655)	0.1037996
Mega	0.0536028	0.0488529	1.0972283	0.2734980	(0.0425689)	0.1497744	(0.0425689)	0.1497744
Large	0.0867404	0.0225581	3.8452060	0.0001496	0.0423327	0.1311481	0.0423327	0.1311481
Mid to Large	0.0968302	0.0221411	4.3733247	0.0000174	0.0532433	0.1404171	0.0532433	0.1404171
Mid	0.0941832	0.0206085	4.5701053	0.0000074	0.0536133	0.1347531	0.0536133	0.1347531
Mid To Small	0.0582296	0.0231500	2.5153171	0.0124608	0.0126566	0.1038026	0.0126566	0.1038026
Small	0.1769355	0.0295786	5.9818645	0.0000000	0.1187071	0.2351639	0.1187071	0.2351639

6. Other

My survey covers 37 valuable respondents of which approximately half of them are investment professionals (Q1). With one exception they all are located in Europe (Q3) and mainly have worked in the industry for up to six years (70%) (Q2). Generally, the respondents' willingness to invest in the asset class is almost always high to very high (two are only moderate) (Q6). For investments into BO funds, the willingness is little lower but still relatively high. The survey includes questions (Appendix XI) that intent to find out if fund size plays a role in making an investment decision and if there exist fund size preferences. The results show that among four options, 55% believe that the brand of the GP (fund managers) is the most important return driver followed by 39% that believe it is the industry focus (Q12). Size is ranked the least important by 52% and the regional focus by 27%. Given this, the theory of 'investing into a blind pool' which says that ultimately the track record of the fund management team drives investors' decisions could be supported. However, respondents also believe that the brand of GPs alone does not drive performance, but that fund strategy is also important (Q21). Earlier in the questionnaire, respondents are asked (Q8, Q9) in which fund size (five options: 'Mid to Small', 'Mid', 'Mid to Large', 'Mega' and 'Not enough information') they would invest into given a time horizon of three and ten years. Respondents choose to invest into large and mega funds (29% and 23%) for the shorter time horizon and 17% choose to invest into small-caps, 31% into mid-caps ('Mid to Small', 'Mid', 'Mid to Large') for the ten-year horizon. This phenomenon could be explained by the fact that smaller funds need more time to drive value because they often rely a lot on organic growth which takes time to prosper. Of the approximately 25% which were not able to make a decision without any further information, the argumentation is the following: people (GPs) and the investment strategy (sector, country, active vs passive ownership) play a more important role for them and that making a decision

solely on fund size (Q10) is difficult. Notably, the opinions hold only true for BO funds and would be subject to changes if we talk about a different fund type (Q11). To lean on the earlier discussed perspective that smaller funds are also riskier, 20 out of 31 agree that small-sized funds have the highest return potential because they are the most volatile fund size (Q17). Further 60% agrees that small- to mid-sized funds outperform larger BO vehicles (Q16). Additionally, 17 (out of 31), of which nine describe themselves as risk takers (Q5), agree that for risk takers small funds offer the best return opportunities' (Q15), twelve disagree. None of the respondents disagree that there is no clear proof that BO funds of one size outperform or underperform those of other sizes (Q18). The survey underlines that size on a standalone basis does not reveal enough to draw a conclusion on a fund's performance. Next, the results give rise to the fact that even if PE was able to make good returns through financial engineering earlier, there is more nowadays what counts for investors, such as skills, expertise and strategy of managers. And as investment teams and strategies can change over time, performance analyses of investors need also to continuously adapt to it (Kaplan and Schoar, 2005).

7. Conclusion

This paper tries to identify the effect of size on fund performance measured by IRR and TVPI. Examine both unrealized and fully realized ('liquidated') fund level data, I find that fund size in dollar terms is insignificant. However, when size is grouped into quartiles (per vintage) or into size categories, I am able to find a significance for fund performance IRR. The survey results reveal that investors not necessarily have a preference towards one size group but rather rank a high importance on fund managers and investment strategy. However, respondents tend to choose larger funds over smaller funds when the investment horizon is shorter and vice versa. This brings about the fact that smaller funds take more time to flourish value creation. Still, 60% of the respondents believe in the outperformance of small-to mid-sized funds over large

funds. The question of which cap size performs better than the other is highly discussed. Setting against the positions, it is still not easy to draw a final conclusion and the debate on fund size will probably continue. In order to dive further into the topic, it could be interesting to look for patterns among PE firms that invest in both smaller and larger funds and analyse how these funds are performing. But here again it is really vague to draw a conclusion as even these funds in one firm could be managed from different teams and under different circumstances. Additionally, future research could take a deeper look into industry-focused funds, e.g. healthcare, and analyze if size plays a role. This being said, instead of focusing on finding out which size performs better in general, it could be more interesting for managers and investors to find out with which strategy, in which time periods and under which external factors funds with a specific size perform better. Finding out the true characteristics and advantages of different fund sizes and knowing how to create value can therefore be meaningful.

8. Resources

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9. Appendix

Appendix I Existing Literature Overview

The table lists existing papers surrounding the topic of private equity fund performance and fund size effect. Notably, none of the papers retrieve their data from Pitchbook as this paper does. Further, mostly the papers span vintages that are before the sample period of this paper. The papers report controversial conclusions in regard to both performance relative to the market (S&P 500) and the size effect.

Paper Authors	Source	Vintage	Funds	Performance to Market	Size Effect
Higson and Stucke (2012)	Cambridge Associates and from a number of LPs	1980 - 2008	1,169 liquidated funds	5% p.a. excess return over S&P 500	No significance
Kaplan and Schoar (2005)	Thomson Venture Economics (as of 2001)	1980 – 2001 (mainly before 1995)	746 liquidated funds (exclude funds with less than $5m committed capital)	Slight underperformance for US buyout funds	Positive concave relationship for VC funds but not for BO funds
Phalippou and Gottschalg (2009)	Thomson Venture Economics (as of 2003)	Before 1995	US and European BO and VC funds – unknown number	Underperformance of 3% compared to S&P 500 'Market growth is driven by a general belief of high performance'	Do not find a concave relationship Performance increases with fund size (lower for first time funds)
Robinson and Sensoy (2011)	Large single LP	1998-2005	837 liquidated BO and VC funds	Outperformance of 2.5% over S&P 500	Significance only after including 'sequence number'
Ljungqvist and Richardson (2003)	Data from one of the largest institutional investors in US	1981 - 1993	73 funds (in which the LP invested)	Excess return of 5-8% p.a. compared to S&P 500	No evidence for a fund size effect
Humphery-Jenner (2011)	Preqin (performance data; also data on fund manager profiles)	After 1985	632 VC funds; 590 BO funds (no distinction between the two)	-	Large PE buyout funds earn lower returns because of suboptimal allocation
Harris et al. (2014)	Burgiss	1993 - 2008	1,400 US BO and VC funds	Outperformance of more than 3% p.a.	No significance
Gottschalg, Gleisberg, Derungs (2015)	Preqin	1998 - 2007	771 mature European and North American funds (primarily BO funds)	-	Inverse relationship: Significance only with 'selection ability': Superiority of a more broadly diversified small/mid-cap strategy over a less diversified large-cap strategy (in particular for European funds)

Appendix II Fund Size Classification and Quartiles

The table states the six size classifications, adopted from Pitchbook and the size cut-off brackets for the fund size quartiles. For each vintage the quartiles are calculated separately.

Fund Size	
5B+	Mega
1B - 4.99B	Large
500M - 999M	Mid to Large
250M - 499M	Mid
100M - 249M	Mid to Small
0 - 99M	Small

in $

Quartiles Fund Size per Vintage				
	Q1	Q2	Q3	Q4
1995	62.30	259.74	445.77	1750.00
1996	101.87	252.50	522.58	3000.00
1997	125.25	350.00	1014.03	6012.00
1998	195.66	389.25	860.03	5000.00
1999	199.95	414.50	904.25	3500.00
2000	130.15	407.50	1150.00	6100.00
2001	142.49	411.12	1166.77	5340.00
2002	128.46	410.00	950.00	6000.00
2003	83.25	278.01	722.03	6773.18
2004	184.62	403.80	800.00	5800.00
2005	225.00	463.10	1250.00	10353.04
2006	267.00	487.95	1175.00	21700.00
2007	205.49	420.00	1100.00	20335.00
2008	251.02	581.50	1500.00	19800.00
2009	210.43	431.60	1355.52	5243.58
2010	191.03	426.96	839.09	4630.00
2011	253.38	465.63	1001.22	17500.00
2012	232.73	533.73	1100.00	11204.00
2013	227.24	427.50	1485.12	18400.00
2014	226.55	504.58	1485.55	13000.00
2015	275.00	750.00	1852.50	13400.00
	Smallest	2nd Smallest	2nd Largest	Largest

Appendix III Performance Averages Among the Six Size Categories, Among Fund Quartiles, and Among Two Size Groups

The tables list the averages in numbers of the Full Data Set which are summarized in the graphs of Table III.

IRRs in %

	MEGA	LARGE	MID TO LARGE	MID	MID TO SMALL	SMALL	TOTAL	CAGR
1995		7.78%	37.39%	21.46%	2.20%	11.66%	15.21%	
1996		12.73%	10.38%	10.07%	8.73%	15.31%	11.10%	*-14.56%*
1997	13.19%	4.92%	5.25%	10.33%	4.63%	27.28%	9.47%	*-14.63%*
1998	10.15%	7.45%	-1.21%	8.33%	9.50%	20.84%	7.08%	*-17.40%*
1999		11.95%	10.23%	14.93%	10.21%	17.06%	12.60%	*-3.70%*
2000	16.80%	13.81%	13.00%	13.49%	17.87%	16.47%	14.93%	*-0.31%*
2001	14.71%	26.43%	24.45%	26.72%	11.00%	30.11%	23.22%	*6.23%*
2002	16.10%	26.04%	11.85%	19.35%	-4.67%	19.78%	15.39%	*0.15%*
2003	30.49%	22.28%	12.50%	18.09%	28.68%	40.70%	27.35%	*6.73%*
2004	15.23%	14.97%	5.73%	20.30%	19.51%	15.65%	15.85%	*0.41%*
2005	9.66%	8.23%	7.97%	11.48%	7.42%	10.38%	9.11%	*-4.55%*
2006	5.38%	9.44%	9.01%	9.69%	3.07%	9.58%	8.30%	*-4.93%*
2007	9.75%	9.40%	10.21%	11.67%	11.21%	5.45%	10.12%	*-3.09%*
2008	13.51%	10.27%	10.03%	10.03%	7.15%	22.62%	11.42%	*-2.03%*
2009	18.65%	12.70%	17.85%	17.71%	17.49%	20.24%	17.12%	*0.79%*
2010		8.12%	15.75%	10.14%	9.45%	26.26%	12.89%	*-1.03%*
2011	15.91%	15.51%	16.50%	23.67%	15.41%	5.72%	16.55%	*0.50%*
2012	17.64%	15.76%	15.28%	16.63%	15.53%	26.62%	17.00%	*0.62%*
2013	15.32%	15.73%	12.12%	14.41%	16.38%	18.66%	15.18%	*-0.01%*
2014	14.59%	15.95%	20.91%	18.90%	13.83%	15.93%	17.25%	*0.63%*
2015	10.61%	16.91%	18.74%	15.66%	13.76%	6.10%	15.32%	*0.03%*
MEAN	14.57%	13.64%	13.52%	15.38%	11.35%	18.21%		
MEDIAN	14.71%	12.73%	12.12%	14.93%	11.00%	17.06%		

TVPIs (x)

	MEGA	LARGE	MID TO LARGE	MID	MID TO SMALL	SMALL	TOTAL	CAGR
1995		1.34	1.99	2.50	1.13	1.70	1.98	
1996		1.34	1.65	1.24	1.46	2.29	1.59	*-10.43%*
1997	1.7	1.73	1.45	1.51	1.54	2.13	1.66	*-5.74%*
1998	1.65	1.48	1.33	1.50	1.63	1.74	1.50	*-6.71%*
1999		1.75	1.79	1.83	1.58	1.98	1.78	*-2.10%*
2000	1.91	1.65	1.76	1.84	2.47	2.35	1.96	*-0.15%*
2001	2.28	2.04	2.02	1.62	1.66	4.38	2.23	*1.71%*
2002	2.07	2.10	1.51	2.33	1.20	2.41	1.90	*-0.48%*
2003	2.11	1.99	1.56	1.79	2.35	2.02	1.97	*-0.05%*
2004	1.95	1.81	1.44	1.95	1.86	2.38	1.81	*-0.90%*
2005	1.72	1.47	1.52	1.63	1.50	1.39	1.54	*-2.27%*
2006	1.51	1.55	1.54	1.57	1.23	1.69	1.51	*-2.23%*
2007	1.63	1.46	1.37	1.60	1.68	1.87	1.57	*-1.76%*
2008	1.76	1.57	1.68	1.55	1.21	1.42	1.54	*-1.79%*
2009	2.08	1.45	1.90	1.96	1.64	1.95	1.76	*-0.77%*
2010		1.34	1.74	1.53	1.33	1.55	1.50	*-1.71%*
2011	1.845	1.68	1.56	1.83	1.68	1.33	1.67	*-1.00%*
2012	1.68	1.61	1.61	1.52	1.32	2.32	1.62	*-1.10%*
2013	1.47	1.47	1.32	1.42	1.38	1.57	1.42	*-1.73%*
2014	1.45	1.43	1.56	1.49	1.31	1.17	1.43	*-1.62%*
2015	1.21	1.35	1.35	1.27	1.24	1.37	1.31	*-1.93%*
MEAN	1.76	1.60	1.60	1.69	1.54	1.95		
MEDIAN	1.72	1.55	1.56	1.60	1.50	1.87		

SMALL: Fund Quartiles 1 and 2

	Volume (in M)	Mean IRR	Mean TVPI
1995	$ 4,895.05	13.11%	2.03
1996	$ 6,851.07	10.91%	1.62
1997	$ 6,262.97	12.26%	1.69
1998	$ 8,997.72	10.92%	1.59
1999	$ 9,513.97	13.70%	1.79
2000	$ 9,517.15	16.00%	2.16
2001	$ 6,225.95	21.64%	2.38
2002	$ 5,413.07	11.46%	1.96
2003	$ 5,503.18	31.33%	2.06
2004	$ 8,293.31	19.08%	1.97
2005	$ 14,873.36	9.95%	1.55
2006	$ 20,795.07	8.11%	1.48
2007	$ 21,431.49	10.56%	1.68
2008	$ 12,539.31	12.89%	1.41
2009	$ 7,509.76	18.16%	1.83
2010	$ 9,059.11	12.82%	1.44
2011	$ 11,600.66	17.22%	1.69
2012	$ 13,575.43	18.51%	1.62
2013	$ 12,766.57	15.69%	1.42
2014	$ 11,780.37	16.88%	1.36
2015	$ 12,472.43	13.33%	1.28
Grand Total	$ 219,877.00		

LARGE: Fund Quartiles 3 and 4

	Volume (in M)	Mean IRR	Mean TVPI
1995	$ 6,843.59	22.58%	1.77
1996	$ 16,510.72	11.48%	1.52
1997	$ 52,376.71	5.79%	1.62
1998	$ 46,385.43	2.34%	1.39
1999	$ 45,069.50	11.20%	1.77
2000	$ 83,185.38	13.73%	1.71
2001	$ 48,155.05	25.15%	2.04
2002	$ 44,006.66	19.14%	1.84
2003	$ 36,827.41	19.64%	1.81
2004	$ 50,299.23	11.37%	1.63
2005	$ 138,839.70	8.37%	1.52
2006	$ 235,752.34	8.46%	1.54
2007	$ 215,181.88	9.68%	1.46
2008	$ 205,052.41	10.67%	1.63
2009	$ 50,906.87	15.72%	1.69
2010	$ 40,021.58	12.95%	1.57
2011	$ 99,612.32	15.93%	1.64
2012	$ 145,644.44	15.75%	1.62
2013	$ 138,435.94	14.69%	1.42
2014	$ 135,743.65	17.51%	1.48
2015	$ 168,908.64	16.68%	1.33
Grand Total	$2,003,759.45		

Quartile 1

	Volume (in M)	Mean IRR	Mean TVPI
1995	$ 309.90	12.89%	1.79
1996	$ 603.03	15.64%	2.29
1997	$ 774.97	24.54%	2.20
1998	$ 2,167.52	14.41%	1.68
1999	$ 1,879.05	13.76%	1.76
2000	$ 1,577.99	16.47%	2.47
2001	$ 1,028.73	24.55%	3.55
2002	$ 990.46	11.49%	2.10
2003	$ 548.62	41.67%	2.01
2004	$ 1,715.62	17.32%	2.12
2005	$ 3,009.97	9.12%	1.48
2006	$ 5,861.20	6.83%	1.45
2007	$ 4,670.45	10.41%	1.79
2008	$ 3,916.14	15.15%	1.32
2009	$ 1,834.87	19.54%	1.86
2010	$ 2,368.18	19.01%	1.50
2011	$ 2,873.90	10.88%	1.51
2012	$ 4,117.31	20.15%	1.75
2013	$ 3,247.37	17.38%	1.42
2014	$ 3,231.87	16.94%	1.28
2015	$ 4,595.62	13.44%	1.28
Grand Total	$ 51,322.77	16.74%	1.84

Quartile 2

	Volume (in M)	Mean IRR	Mean TVPI
1995	$ 1,210.69	5.08%	1.52
1996	$ 2,137.99	7.93%	1.46
1997	$ 3,085.90	5.71%	1.41
1998	$ 5,129.71	6.47%	1.46
1999	$ 5,409.92	14.81%	1.91
2000	$ 5,727.24	16.60%	1.98
2001	$ 3,856.87	15.60%	1.63
2002	$ 3,086.61	9.58%	1.89
2003	$ 2,305.64	26.89%	2.23
2004	$ 4,833.89	22.04%	1.87
2005	$ 9,980.95	8.94%	1.44
2006	$ 13,942.18	8.54%	1.50
2007	$ 12,633.20	11.61%	1.60
2008	$ 12,791.22	11.13%	1.56
2009	$ 4,753.89	17.79%	1.81
2010	$ 5,349.08	6.71%	1.42
2011	$ 8,260.51	23.50%	1.79
2012	$ 11,500.75	16.10%	1.48
2013	$ 9,089.20	13.89%	1.41
2014	$ 10,048.50	2.00%	1.53
2015	$ 13,608.33	13.31%	1.27
Grand Total	$ 148,742.27	12.58%	1.63

Quartile 3

	Volume (in M)	Mean IRR	Mean TVPI
1995	$ 2,405.69	12.66%	2.40
1996	$ 5,137.25	9.18%	1.21
1997	$ 10,506.13	5.54%	1.41
1998	$ 10,612.88	0.49%	1.48
1999	$ 11,134.71	10.18%	1.71
2000	$ 16,754.46	13.26%	1.77
2001	$ 9,450.93	25.56%	1.98
2002	$ 8,614.50	12.11%	1.49
2003	$ 6,098.32	17.70%	1.79
2004	$ 8,200.87	17.97%	1.62
2005	$ 23,552.23	10.95%	1.70
2006	$ 29,534.08	9.53%	1.57
2007	$ 28,995.08	8.95%	1.43
2008	$ 30,066.82	9.97%	1.64
2009	$ 10,485.04	16.01%	1.83
2010	$ 11,573.87	15.98%	1.69
2011	$ 15,510.11	16.85%	1.62
2012	$ 23,047.42	16.37%	1.64
2013	$ 21,556.23	12.55%	1.33
2014	$ 23,525.48	16.97%	1.45
2015	$ 38,090.83	17.30%	1.33
Grand Total	$ 344,852.93	13.15%	1.62

Quartile 4

	Volume (in M)	Mean IRR	Mean TVPI
1995	$ 7,812.36	28.70%	2.17
1996	$ 15,483.52	12.38%	1.57
1997	$ 38,260.68	5.55%	1.73
1998	$ 37,473.04	5.51%	1.38
1999	$ 36,159.79	11.76%	1.74
2000	$ 68,642.84	13.80%	1.70
2001	$ 40,044.47	25.91%	2.06
2002	$ 36,728.16	25.00%	2.10
2003	$ 33,378.01	21.58%	1.85
2004	$ 43,842.16	9.57%	1.68
2005	$ 117,169.91	7.76%	1.51
2006	$ 207,209.95	8.10%	1.51
2007	$ 190,314.64	9.65%	1.49
2008	$ 170,817.54	10.66%	1.62
2009	$ 41,342.83	14.53%	1.55
2010	$ 29,789.56	9.64%	1.40
2011	$ 84,568.46	15.65%	1.73
2012	$ 120,554.39	15.58%	1.64
2013	$ 117,309.71	16.51%	1.51
2014	$ 110,718.17	15.97%	1.45
2015	$ 125,086.29	16.79%	1.36
Grand Total	$1,672,706.48	14.31%	1.65

Appendix IV Descriptive Statistic Full Data Set, Reduced Model and Selective Data Set

The tables show the number of funds, total fund size, performance means, and medians for the Full Data Set and the three sub-sets, the Reduced Model and the two different Selective Data Sets. The Reduced Model applies the liquidation condition to the full sample, resulting at 264 observations. The differences among the performance measures indicate that the liquidated funds in this sample have on average higher performance values.

Descriptive Statistic

						Vintages 1998, 1999, 2000, 2001		Vintages 2006, 2007, 2008	
	Full Data Set	IRR Data Set	TVPI Data Set	Reduced IRR Data Set	Reduced TVPI Data Set	Selective IRR Data Set	Selective TVPI Data Set	Selective IRR Data Set	Selective TVPI Data Set
Total Number of Funds	1,953	1,539	1,721	171	221	210	196	292	359
Total Size Volume in $m	$ 2,237,307.90	$ 1,982,991.28	$ 2,100,114.94	$ 104,061.31	$ 129,466.04	$ 214,331.35	$ 202,907.43	$ 552,688.36	$ 602,390.46
Mean Fund Size	1,145.57	1,288.49	1,220.29	608.55	585.82	1,020.63	1,035.24	1,892.77	1,677.97
Median Fund Size	442.53	500.00	475.00	331.01	317.62	537.15	516.75	701.00	575.00
Min Fund Size	2.00	2.00	3.00	7.00	7.00	23.00	15.00	3.00	7.01
Max Fund Size	21,700.00	21,700.00	21,700.00	4,000.00	6,012.00	6,100.00	6,100.00	21,700.00	21,700.00
Mean IRR	13.75%	13.72%		14.61%		13.99%		11.25%	
Median IRR	12.50%	12.50%		11.80%		12.67%		10.71%	
Mean TVPI	1.62		1.62		1.88		1.82		1.57
Median TVPI	1.51		1.51		1.73		1.72		1.53

sorted by size and in $m

	Full Data Set			Reduced Data Set				Difference	
	Fund Size Volume	Mean IRR	Mean TVPI	Fund Size Volume	Mean IRR	Mean TVPI	Number Funds	IRR in units	TVPI in units
1995	$ 11,738.64	15.21%	1.98	$ 7,967.32	10.56%	2.06	25	10.56%	0.08
1996	$ 23,361.79	11.10%	1.59	$ 11,932.75	8.95%	1.55	32	8.95%	-0.03
1997	$ 58,639.68	9.47%	1.66	$ 35,572.20	9.39%	1.65	35	9.39%	-0.01
1998	$ 55,383.15	7.08%	1.50	$ 20,056.56	6.70%	1.55	37	6.70%	0.06
1999	$ 54,583.47	12.60%	1.78	$ 17,002.12	12.21%	1.73	28	12.21%	-0.05
2000	$ 92,702.53	14.93%	1.96	$ 17,150.81	15.56%	2.00	33	15.56%	0.04
2001	$ 54,381.00	23.22%	2.23	$ 11,452.49	26.65%	2.27	17	26.65%	0.04
2002	$ 49,419.73	15.39%	1.90	$ 1,936.70	-4.14%	2.30	3	-4.14%	0.40
2003	$ 42,330.59	27.35%	1.97	$ 2,985.25	40.58%	2.23	18	40.58%	0.26
2004	$ 58,592.54	15.85%	1.81	$ 4,606.71	38.44%	2.51	8	38.44%	0.71
2005	$ 153,713.06	9.11%	1.54	$ 10,696.67	13.56%	2.08	9	13.56%	0.54
2006	$ 256,547.41	8.30%	1.51	$ 3,760.07	12.74%	1.67	7	12.74%	0.17
2007	$ 236,613.37	10.12%	1.57	$ 2,250.49	21.49%	2.53	5	21.49%	0.96
2008	$ 217,591.72	11.42%	1.54	$ 18.00	3.48%	1.12	1	3.48%	-0.42
2009	$ 58,416.63	17.12%	1.76	$ 85.00	-	1.05	1		
2010	$ 49,080.69	12.89%	1.50	$ 596.51	32.03%	2.35	4	32.03%	0.85
2011	$ 111,212.98	16.55%	1.67	$ 34.01	51.00%	3.50	1	51.00%	1.83
2012	$ 159,219.87	17.00%	1.62						
2013	$ 151,202.51	15.18%	1.42						
2014	$ 147,524.02	17.25%	1.43						
2015	$ 181,381.07	15.32%	1.31						
TOTAL	$ 2,223,636.45	14.40%	1.68	$ 148,103.66	18.70%	2.01			

for 2009 there is only one liquidated fund fund

Reduced Data Set: Fund Size Volume (in $M) and #Funds

	MEGA		LARGE		MID TO LARGE		MID		MID TO SMALL		SMALL		TOTAL	
	Volume (in $M)	#Funds	Volume (in $M)	#Funds	Volume (in $M)	#Funds	Volume (in $M)	#Funds	Volume (in $M)	#Funds	Volume (in $M)	#Funds	Volume (in $M)	#Funds
1995			3,150.00 4%	2 5%	604 2%	1 3%	3,346.46 15%	10 16%	499.00 5%	3 5%	367.86 14%	9 15%	7,967.32 5%	25 9%
1996			4,950.00 6%	4 9%	2110.5 9%	4 11%	3,058.05 13%	8 13%	1,499.09 15%	10 17%	315.11 12%	6 10%	11,932.75 8%	32 12%
1997	6,012.00	1	21,932.30 26%	10 23%	4036.03 17%	6 16%	2,614.10 12%	7 11%	669.70 7%	4 7%	308.07 11%	7 12%	35,572.20 24%	35 13%
1998			8,297.78 10%	4 9%	6693.09 28%	10 27%	3,274.81 14%	9 15%	1,493.15 15%	9 15%	297.73 11%	5 8%	20,056.56 14%	37 14%
1999			10,076.39 12%	6 14%	2847.21 12%	4 11%	2,867.50 13%	7 11%	968.65 10%	6 10%	242.37 9%	5 8%	17,002.12 11%	28 11%
2000			9,295.36 11%	5 11%	3782.85 16%	6 16%	2,735.40 12%	8 13%	1,089.96 11%	8 13%	247.24 9%	6 10%	17,150.81 12%	33 13%
2001			9,434.01 11%	6 14%	653 3%	1 3%	450.00 2%	1 2%	717.17 7%	4 7%	198.31 7%	5 8%	11,452.49 8%	17 6%
2002			1,750.00 2%	1 2%					150.00 2%	1 2%	36.70 1%	1 2%	1,936.70 1%	3 1%
2003					500 2%	1 3%	946.51 4%	3 5%	1,251.24 13%	7 12%	287.50 11%	7 12%	2,985.25 2%	18 7%
2004			3,059.62 4%	1 2%			753.80 3%	2 3%	727.69 8%	4 7%	65.60 2%	1 2%	4,606.71 3%	8 3%
2005			8,848.00 11%	3 7%	715 3%	1 3%	1,004.39 4%	3 5%	121.65 1%	1 2%	7.63 0%	1 2%	10,696.67 7%	9 3%
2006			1,030.15 1%	1 2%	1712.19 7%	2 5%	736.95 3%	2 3%	182.00 2%	1 2%	98.78 4%	1 2%	3,760.07 3%	7 3%
2007			1,060.07 1%	1 2%	509.61 2%	1 3%	485.81 2%	1 2%	185.00 2%	1 2%	10.00 0%	1 2%	2,250.49 2%	5 2%
2008											18.00 1%	1 2%	18.00 0%	1 0%
2009											85.00 3%	1 2%	85.00 0%	1 0%
2010							405.00 2%	1 2%	119.98 1%	1 2%	71.53 3%	2 3%	596.51 0%	4 2%
2011											34.01 1%	1 2%	34.01 0%	1 0%
MEAN	6,012.00	1	6,906.97	4	2,196.68	3	1,744.52	5	691.02	4	158.32	4	8,711.98	16
MEDIAN	6,012.00	1	6,623.89	4	1,712.19	2	1,004.39	3	693.44	4	98.78	2	4,606.71	9
TOTAL	6,012.00 4%	1 0%	82,883.68 56%	44 17%	24,163.48 16%	37 14%	22,678.78 15%	62 23%	9,674.28 7%	60 23%	2,691.44 2%	60 23%	148,103.66	264

Appendix V The 20 Best and Worst Performing Funds

The tables show the 20 best and worst performing funds of the Full Data Set and the Reduced Data Set according to TVPI and IRR. To the right are the percentages shown absorbed by each size classification. Notably, ‘Mega’ funds are not among the best and worst performing funds.

Best Performing Funds According to TVPI and IRR

	Fund Name	TVPI	IRR	Sum of Fund Size (in $M)
1	GCP California Fund	8.48	0.90	50.00
2	Axcel III	7.00	0.68	485.14
3	KCB Growth and Income Fund I	6.92	No Data	27.71
4	GP Tecnologia	6.76	No Data	68.00
5	Renovare Capital Partners	6.67	0.46	13.75
6	Sun Capital Partners I	5.80	0.62	28.00
7	Apax UK V	5.38	No Data	262.48
8	MB Equity Fund II	5.21	0.40	40.00
9	Seaport Capital Partners IV	4.99	0.40	39.00
10	Alpine Investors Fund IV	4.78	0.28	262.00
11	Alpha Capital Fund III	4.57	0.14	32.00
12	Clearview Capital Pledge Fund	4.51	0.19	36.70
13	Highcrest Partners	4.35	0.28	15.00
14	Thoma Bravo Fund IX	4.28	0.45	822.50
15	Wexford Partners IV	4.21	0.30	115.50
16	EQT I	4.19	0.65	483.79
17	MB Equity Fund	4.12	0.74	18.23
18	Close Brothers Private Equity Fund VI	4.09	No Data	291.76
19	Greenhill Capital Partners	4.04	0.46	423.00
20	Blue Sage Capital	4.00	0.22	150.00

	Fund Name	TVPI	IRR	Sum of Fund Size (in $M)
1	AUCTUS I	3.95	2.40	38.24
2	Metapoint Partners Fund III	No Data	1.04	31.80
3	Shamrock Capital Growth Fund III	2.18	0.99	400.00
4	T3 Partners II	3.07	0.94	378.00
5	GCP California Fund	8.48	0.90	50.00
6	ChrysCapital III	No Data	0.89	258.00
7	AUCTUS IV	1.24	0.74	261.05
8	MB Equity Fund	4.12	0.74	18.23
9	Consonance Private Equity	3.37	0.71	500.00
10	Axcel III	7.00	0.68	485.14
11	Holland Venture Ondememers Fonds	3.60	0.67	10.05
12	EQT I	4.19	0.65	483.79
13	Finnventure Fund III	3.93	0.63	38.11
14	Sun Capital Partners I	5.80	0.62	28.00
15	EIV Capital Fund I	3.23	0.62	50.00
16	Atlantic Street Capital I	1.81	0.61	41.15
17	Triton Fund IA	3.40	0.61	50.81
18	1995 Riverside Capital Appreciation Fu	3.31	0.60	60.00
19	Sponsor Fund II	3.02	0.60	109.74
20	OCM/GFI Power Opportunities Fund II	3.02	0.58	1,021.00

	TVPI	IRR
Small	55%	55%
Mid to Small	10%	5%
Mid	30%	30%
Mit to Large	5%	5%
Large	0%	5%

Worst Performing Funds According to TVPI and IRR

	Fund Name	TVPI	IRR	Sum of Fund Size (in $M)
1	Reliant Equity Investors	0.02	(0.50)	126.00
2	The Louisiana Sustainability Fund	0.03	(0.85)	16.00
3	Belvedere Capital Fund II	0.05	(0.39)	150.00
4	Exxel Capital Partners V	0.06	(0.32)	866.70
5	MidOcean Partners II	0.07	-	520.00
6	Lion Capital Fund II	0.07	(0.05)	2,975.69
7	Advent Japan Private Equity Fund	0.08	(0.98)	726.84
8	ACI Capital Investors II	0.09	-	335.00
9	Candover 2008 Fund	0.11	-	3,853.12
10	LM Capital Fund II	0.11	(0.84)	35.00
11	Clarity Partners II	0.12	-	750.00
12	Celtic Pharmaceutical Holdings	0.18	(0.16)	436.15
13	Thayer Equity Investors III	0.18	-	364.00
14	Clarity PSERS II	0.20	-	31.38
15	Private Equity Managers Deutsche	0.21	-	78.00
16	Evergreen Pacific Partners	0.23	-	275.00
17	TCW/Latin America Private Equity Partr	0.23	(0.19)	228.70
18	Saw Mill Capital Fund V	0.24	-	10.80
19	Vision Capital Partners V-A	0.25	(0.12)	155.03
20	3Stone Inflection Fund	0.27	-	14.90

	Fund Name	TVPI	IRR	Sum of Fund Size (in $M)
1	Westsphere Latin America PE Growth F	-	(1.00)	500.00
2	KD Private Equity Fund	-	(1.00)	40.68
3	Advent Japan Private Equity Fund	0.08	(0.98)	726.84
4	REF Fadata	0.35	(0.86)	3.00
5	The Louisiana Sustainability Fund	0.03	(0.85)	16.00
6	LM Capital Fund II	0.11	(0.84)	35.00
7	Reliant Equity Investors	0.02	(0.50)	126.00
8	Provender Opportunities Fund II	0.40	(0.47)	150.00
9	Markstone Capital Partners	0.43	(0.44)	800.00
10	Lone Star Opportunities Fund V	0.36	(0.40)	160.00
11	Belvedere Capital Fund II	0.05	(0.39)	150.00
12	Candover 2005 Fund US No. 3	0.52	(0.35)	4,342.00
13	Atlantic Medical Capital	-	(0.33)	81.00
14	Forstmann Little Sub Debt & Equity Fun	-	(0.33)	1,698.90
15	Sunrise Capital Partners	0.87	(0.33)	207.90
16	Exxel Capital Partners V	0.06	(0.32)	866.70
17	Wingate Partners V	0.27	(0.29)	255.00
18	Longroad Capital Partners III	0.46	(0.28)	285.00
19	Aureos Central America Fund	-	(0.27)	36.30
20	Nogales Investors II	-	(0.24)	245.00

	TVPI	IRR
Small	30%	30%
Mit to Small	20%	30%
Mid	20%	10%
Mit to Large	20%	20%
Large	10%	10%

Best Performing Funds According to TVPI and IRR - Only Liquidated Funds

	Fund Name	TVPI	IRR	Sum of Fund Size (in $M)
1	Axcel III	7.00	0.68	485.14
2	Sun Capital Partners I	5.80	0.62	28.00
3	Apax UK V	5.38	-	262.48
4	Clearview Capital Pledge Fund	4.51	0.19	36.70
5	Highcrest Partners	4.35	0.28	15.00
6	EQT I	4.19	0.65	483.79
7	Veritas Capital Fund II	3.96	0.40	153.00
8	AUCTUS I	3.95	2.40	38.24
9	Hudson Ferry Capital Fund I	3.94	0.39	10.00
10	Finnventure Fund III	3.93	0.63	38.11
11	Industri Kapital 1994 Fund	3.80	-	327.81
12	White Knight V	3.51	0.37	43.54
13	Constellation III German Asset Light	3.50	0.51	34.01
14	ABRY Broadcast Partners II	3.46	-	250.00
15	KPS Special Situations Fund II	3.44	0.56	403.80
16	Fenno Program/Skandia II	3.33	0.44	7.35
17	PAI Europe III	3.32	0.38	1,734.04
18	1995 Riverside Capital Appreciation Fu	3.31	0.60	60.00
19	Industrial Opportunity Partners I	3.16	0.25	185.00
20	Acom General Fund One	3.10	0.39	8.73

	Fund Name	TVPI	IRR	Sum of Fund Size (in $M)
1	AUCTUS I	3.95	2.40	38.24
2	Metapoint Partners Fund III	-	1.04	31.80
3	Axcel III	7.00	0.68	485.14
4	EQT I	4.19	0.65	483.79
5	Finnventure Fund III	3.93	0.63	38.11
6	Sun Capital Partners I	5.80	0.62	28.00
7	1995 Riverside Capital Appreciation Fu	3.31	0.60	60.00
8	Sponsor Fund II	3.02	0.60	109.74
9	White Knight IV	3.03	0.58	38.65
10	Pacific Equity Partners Supplementary	2.60	0.57	115.43
11	KPS Special Situations Fund II	3.44	0.56	403.80
12	Waterland Private Equity Fund II B.V.	2.52	0.56	209.63
13	Advent Global Private Equity IV	3.06	0.52	1,900.00
14	Constellation III German Asset Light	3.50	0.51	34.01
15	Levmark Capital	2.30	0.50	40.00
16	GI Partners Fund I	-	0.46	653.00
17	Fenno Program/Skandia II	3.33	0.44	7.35
18	Capiton II	3.02	0.44	139.68
19	Veritas Capital Fund II	3.96	0.40	153.00
20	Acom General Fund One	3.10	0.39	8.73

	TVPI	IRR
Small	55%	50%
Mit to Small	10%	25%
Mid	30%	15%
Mit to Large	0%	5%
Large	5%	5%

Worst Performing Funds According to TVPI and IRR - Only Liquidated Funds

	Fund Name	TVPI	IRR	Sum of Fund Size (in $M)
1	Exxel Capital Partners V	0.06	(0.32)	866.70
2	LM Capital Fund II	0.11	(0.84)	35.00
3	Thayer Equity Investors III	0.18	-	364.00
4	Alpha Capital Fund II	0.32	(0.20)	22.00
5	Provender Opportunities Fund II	0.40	(0.47)	150.00
6	Finnventure Fund V ET	0.42	0.04	46.37
7	Heritage Fund III	0.48	(0.24)	843.00
8	TSG Capital Fund III	0.57	(0.14)	515.00
9	Texas Growth Fund 1995 Trust	0.62	(0.11)	75.00
10	Excelsior V	0.64	-	410.00
11	TSG Capital Fund II	0.66	(0.09)	226.00
12	Riverlake Equity Partners Fund (OR)	0.68	(0.07)	7.63
13	Apax Israel II	0.68	(0.07)	102.50
14	Trivest Fund II	0.70	(0.04)	210.00
15	Westsphere South America Private Equ	0.75	(0.07)	180.00
16	Cortec Group Fund II	0.87	(0.00)	331.70
17	Phoenix Equity Partners Fund II	0.87	(0.02)	221.70
18	Thomas H. Lee Equity Partners IV	0.87	(0.03)	3,500.00
19	Heritage Fund II	0.91	(0.02)	380.00
20	VSS Communications Partners IV	0.92	(0.05)	1,300.00

	Fund Name	TVPI	IRR	Sum of Fund Size (in $M)
1	Westsphere Latin America PE Growth F	-	(1.00)	500.00
2	LM Capital Fund II	0.11	(0.84)	35.00
3	Provender Opportunities Fund II	0.40	(0.47)	150.00
4	Atlantic Medical Capital	-	(0.33)	81.00
5	Forstmann Little Sub Debt & Equity Fun	-	(0.33)	1,698.90
6	Exxel Capital Partners V	0.06	(0.32)	866.70
7	Heritage Fund III	0.48	(0.24)	843.00
8	Forstmann Little Equity Fund VI	-	(0.22)	3,200.00
9	Hicks Muse Tate & Furst Latin Am. Fun	-	(0.20)	125.00
10	Alpha Capital Fund II	0.32	(0.20)	22.00
11	TSG Capital Fund III	0.57	(0.14)	515.00
12	North American Fund III	-	(0.11)	65.00
13	Texas Growth Fund 1995 Trust	0.62	(0.11)	75.00
14	Willis Stein & Partners II	-	(0.09)	840.00
15	TSG Capital Fund II	0.66	(0.09)	226.00
16	Riverlake Equity Partners Fund (OR)	0.68	(0.07)	7.63
17	Westsphere South America Private Equ	0.75	(0.07)	180.00
18	Apax Israel II	0.68	(0.07)	102.50
19	Euroknights III	-	(0.07)	106.60
20	Brentwood Associates Buyout Fund II	-	(0.06)	240.00

	TVPI	IRR
Small	25%	30%
Mit to Small	30%	35%
Mid	20%	0%
Mit to Large	15%	25%
Large	10%	10%

Appendix VI The 20 Largest Investors

The table lists the 20 largest investors (GPs) according to fund size volume.

The 20 Largest Investors

	Investor	Total Fund Size Volume(in $M)	Mean IRR	Max IRR	Min IRR	Mean TVPI	Max TVPI	Min TVPI
1	The Carlyle Group	79,396.00	13.08%	37.00%	-1.50%	1.45	2.80	0.92
2	Kohlberg Kravis Roberts	73,414.57	12.27%	22.22%	0.50%	1.79	2.40	1.00
3	TPG Capital	67,328.00	22.90%	93.85%	4.94%	1.94	3.76	1.26
4	The Blackstone Group	63,699.51	15.27%	36.00%	6.00%	1.68	2.50	1.25
5	Warburg Pincus	61,244.00	11.19%	14.71%	8.19%	1.70	2.28	1.18
6	CVC Capital Partners	59,872.64	17.11%	40.99%	-5.24%	1.96	2.72	1.25
7	Apollo Global Management	53,458.00	14.17%	44.00%	2.00%	1.52	2.00	1.06
8	Bain Capital	46,453.10	20.12%	49.40%	7.40%	1.89	2.60	1.41
9	Goldman Sachs Merchant Banking Divis	38,610.00	7.67%	18.26%	0.36%	1.59	2.34	1.02
10	Lone Star Funds	37,801.00	21.04%	47.21%	-2.30%	1.51	2.34	0.89
11	Apax Partners	36,513.22	7.19%	13.70%	-6.80%	1.89	5.38	0.64
12	Advent International	35,570.13	7.37%	52.00%	-98.30%	1.54	3.06	0.08
13	Hellman & Friedman	31,748.80	20.64%	27.67%	13.01%	2.10	2.68	1.20
14	Permira	28,719.71	17.95%	24.98%	8.60%	1.86	2.48	1.60
15	EQT	28,048.70	17.76%	65.43%	8.82%	1.95	4.19	1.24
16	Silver Lake Management	26,900.00	18.32%	25.94%	11.07%	1.94	2.20	1.70
17	BC Partners	25,716.29	18.31%	28.40%	4.70%	2.01	2.73	1.25
18	Providence Equity Partners	25,472.00	11.93%	23.86%	3.08%	1.52	2.04	1.22
19	Cinven	23,086.07	16.46%	31.90%	7.40%	1.74	2.17	1.44
20	Thomas H. Lee Partners	21,700.00	16.34%	31.22%	-2.61%	1.38	1.68	0.87

Appendix VII The Four Largest Investors and Its Funds

The table lists the four largest investors plus its underlying funds which are included in the sample set (note only the funds which are in the Pitchbook data set are listed). The total fund size volume and average IRRs and TVPIs are in bold.

The Four Largest Investors and the Respective Funds

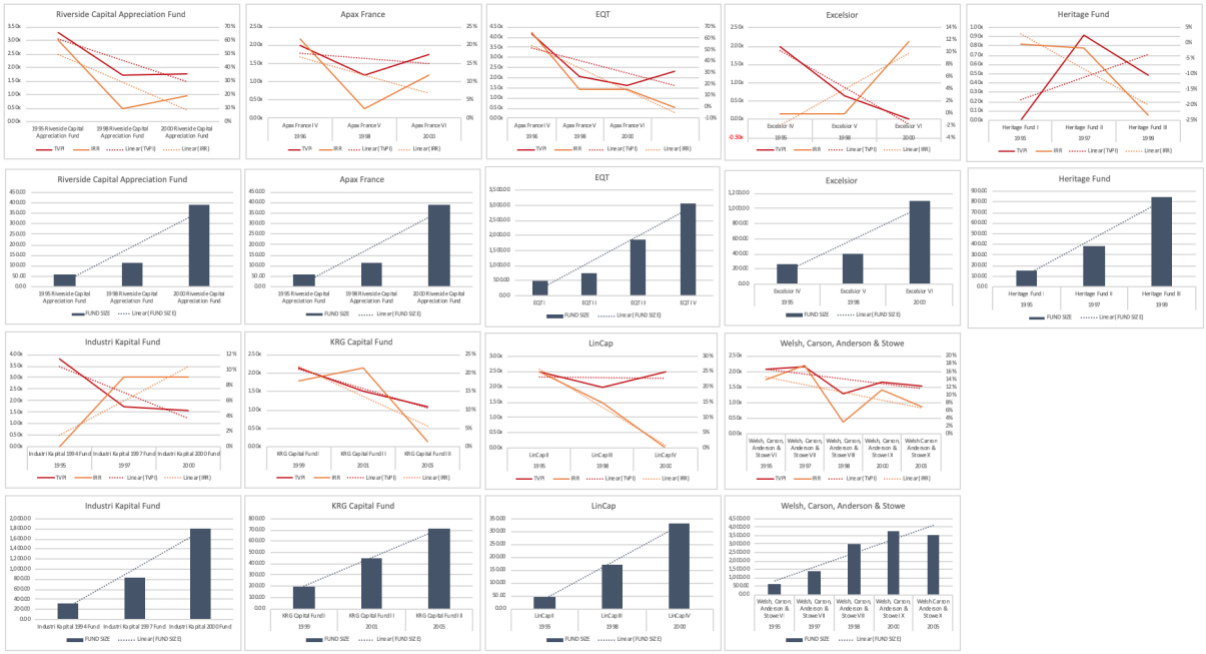
Investor	Total Fund Size Volume (in $M)	IRR	TVPI
The Carlyle Group	**79,396.00**	**13.08%**	**1.45**
Mega	41,917.40	12.75%	1.71
Carlyle Europe Partners III	7,347.40	14.00%	No Data
Carlyle Partners IV	7,850.00	13.00%	2.05
Carlyle Partners V	13,720.00	14.00%	1.78
Carlyle Partners VI	13,000.00	10.00%	1.31
Large	30,188.25	11.24%	1.22
Carlyle Asia Growth Partners IV	1,041.40	4.00%	No Data
Carlyle Asia Partners II	1,810.00	8.00%	No Data
Carlyle Asia Partners III	2,551.60	11.00%	1.37
Carlyle Asia Partners IV	3,900.00	8.00%	1.19
Carlyle Europe Partners	1,119.72	11.00%	No Data
Carlyle Europe Partners II	2,902.00	20.00%	No Data
Carlyle Europe Partners IV	4,147.27	8.00%	1.10
Carlyle Global Financial Services Partners	1,100.00	14.00%	No Data
Carlyle Global Financial Services Partners II	1,000.00	14.00%	1.22
Carlyle Japan Partners II	1,872.56	4.00%	No Data
Carlyle Partners II	1,331.00	25.00%	No Data
Carlyle Partners III	3,912.70	21.00%	No Data
Carlyle U.S. Equity Opportunity Fund	1,100.00	9.00%	No Data
Carlyle U.S. Equity Opportunity Fund II	2,400.00	0.36%	No Data
Mid to Large	6,558.82	12.82%	1.25
Carlyle Asia Growth Partners III	688.00	-1.50%	0.92
Carlyle Asia Partners	750.00	18.00%	No Data
Carlyle Europe Technology Partners II	693.71	19.00%	No Data
Carlyle Europe Technology Partners III	733.74	23.00%	No Data
Carlyle Japan Partners III	981.35	18.00%	2.02
Carlyle Management Group Partners	590.00	6.01%	1.08
Carlyle South America Buyout Fund	776.00	No Data	1.14
Carlyle Sub Saharan Africa Fund	741.02	No Data	0.97
Carlyle U.S. Growth Fund III	605.00	7.23%	1.38
Mid	731.53	27.50%	2.80
Carlyle Europe Technology Partners	287.30	18.00%	2.80
Carlyle Japan Partners	444.23	37.00%	No Data

Investor	Total Fund Size Volume (in $M)	IRR	TVPI
Kohlberg Kravis Roberts	**73,414.57**	**12.27%**	**1.79**
Mega	61,610.33	12.61%	1.88
KKR 1996 Fund	12,024.00	13.19%	1.70
KKR 2006 Fund	17,642.00	9.20%	2.10
KKR Asian Fund II	5,825.00	13.40%	1.60
KKR European Fund II	5,413.05	4.50%	1.50
KKR European Fund III	5,987.88	11.80%	2.00
KKR Millennium Fund	6,000.00	16.10%	2.40
KKR North America Fund XI	8,718.40	19.50%	2.00
Large	11,499.45	14.53%	1.80
KKR Asia Fund	3,983.00	13.70%	2.20
KKR China Growth	1,010.00	3.30%	1.30
KKR European Fund	3,085.00	22.22%	2.11
KKR European Fund IV	3,421.45	18.90%	1.60
Mid to Small	221.80	0.50%	1.00
KKR European Fund II - Annex	221.80	0.50%	1.00
Small	82.99	No Data	1.86
KKR 2006 Overseas Fund	82.99	No Data	1.86
TPG Capital	**67,328.00**	**22.90%**	**1.94**
Mega	51,400.00	12.12%	1.55
TPG Partners IV	5,800.00	15.23%	1.95
TPG Partners V	15,300.00	4.94%	1.40
TPG Partners VI	19,800.00	10.30%	1.54
TPG Partners VII	10,500.00	18.00%	1.31
Large	15,550.00	13.63%	2.05
T3 Partners I	1,000.00	No Data	3.76
TPG Asia Fund VI	3,300.00	No Data	1.26
TPG Asia Partners V	4,250.00	6.55%	1.42
TPG Partners II	2,500.00	9.91%	1.76
TPG Partners III	4,500.00	24.43%	No Data
Mid	378.00	93.85%	3.07
T3 Partners II	378.00	93.85%	3.07
The Blackstone Group	**63,699.51**	**15.27%**	**1.68**
Mega	57,573.18	17.74%	1.68
Blackstone Capital Partners IV	6,773.18	36.00%	2.50
Blackstone Capital Partners V	21,700.00	8.00%	1.64
Blackstone Capital Partners VI	17,500.00	14.00%	1.61
Blackstone Tactical Opportunities Fund	5,600.00	No Data	1.40
Blackstone Tactical Opportunities Fund II	6,000.00	12.96%	1.25
Large	6,126.33	10.32%	1.70
Blackstone Capital Partners III	3,989.00	14.63%	2.02
Blackstone Communication Partners I	2,137.33	6.00%	1.37

Appendix VIII Randomly Selected Subsequent Funds (Liquidated)

I randomly selected GPs for which the sample set includes three or more subsequent funds. Subsequent funds are raised in the follow up years by GPs. The examples in the graphs show that subsequent funds increase in size whereas performance mainly decreases. No conclusion can be generalized based on these observations.

VINTAGE	FUND NAME	IRR	TVPI	FUND SIZE	CATEGORY	FUND SIZE INCREASE
1995	1995 Riverside Capital Appreciation Fund	59.87%	3.31x	60.00	Small	
1998	1998 Riverside Capital Appreciation Fund	9.78%	1.74x	114.00	Mid to Small	90%
2000	2000 Riverside Capital Appreciation Fund	19.10%	1.76x	392.00	Mid	244%
1996	Apax France IV	21.57%	2.00x	102.49	Mid	
1998	Apax France V	2.65%	1.19x	331.01	Mid	223%
2000	Apax France VI	11.70%	1.74x	656.61	Mid to Large	98%
1998	Astorg II	23.75%	3.06x	194.21	Mid to Small	
2003	Astorg III	30.00%		338.84	Mid	74%
2007	Astorg IV	12.75%	1.95x	1,060.07	Large	213%
1995	EQT I	65.43%	4.19x	483.79	Mid	
1998	EQT II	15.54%	2.07x	768.55	Mid to Large	59%
2001	EQT III	15.23%	1.65x	1,844.28	Large	140%
2004	EQT IV		2.30x	3,059.62	Large	66%
1995	Excelsior IV		1.99x	265.15	Mid	
1998	Excelsior V		0.64x	410.00	Mid	55%
2000	Excelsior VI	11.81%		1,100.00	Large	168%
1995	Heritage Fund I	-0.46%		150.00	Mid to Small	
1997	Heritage Fund II	-1.53%	0.91x	380.00	Mid	153%
1999	Heritage Fund III	-23.53%	0.48x	843.00	Mid to Large	122%
1995	Industri Kapital 1994 Fund		3.80x	327.81	Mid	
1997	Industri Kapital 1997 Fund	9.00%	1.73x	823.94	Mid to Large	151%
2000	Industri Kapital 2000 Fund	9.00%	1.59x	1,814.36	Large	120%
1999	KRG Capital Fund I	17.85%	2.12x	202.00	Mid to Small	
2001	KRG Capital Fund II	21.53%	1.51x	450.00	Mid	123%
2005	KRG Capital Fund III	1.59%	1.09x	715.00	Mid to Large	59%
1995	LinCap II	24.94%	2.50x	45.30	Small	
1998	LinCap III	14.96%	1.98x	173.50	Mid to Small	283%
2000	LinCap IV		2.49x	331.50	Mid	91%
1995	Welsh, Carson, Anderson & Stowe VI	13.94%	2.07x	604.00	Mid to Large	
1997	Welsh, Carson, Anderson & Stowe VII	17.70%	2.18x	1,426.00	Large	136%
1998	Welsh, Carson, Anderson & Stowe VIII	3.12%	1.29x	3,000.00	Large	110.4%
2000	Welsh, Carson, Anderson & Stowe IX	11.19%	1.66x	3,781.00	Large	26.0%
2005	Welsh Carson Anderson & Stowe X	7.14%	1.55x	3,548.00	Large	18.3%



Appendix IX Industry Focus Classification

The table lists on the left all industries provided in the data set by Pitchbook. To the right are the head groups I created in order to cluster industries for the industry dummy.

Software, Information Technology, Computer, Computer Hardware, Software & IT, Consumer electronics, Semiconductors, Electronic Components, IT consulting and Outsourcing, Parts and Peripherals	High Tech Industries
Telecommunications, Media, Communications and Networking, Broadcasting, Radio and Television	TMC
Healthcare, Healthcare Services, Healthcare Products, Healthcare Devices and Supplies, Healthcare Technology Systems, Pharmaceuticals and Biotechnology, Drug Discovery	Healthcare
Consumer Durables, Consumer Non-Durables, Consumer Products and Services (B2C)	Consumer
Business Products and Services (B2B), Other Business Products and Services, BPO/Outsource Services, Legal	B2B
Commercial products, services (Non-Financial), Commercial Services, Commercial Transportation	Commercials
Chemicals and Gases, Transport & Logistics, Commercial Services; Containers and Packaging, Exploration, Production and Refining; Materials	Industrials
Apparel & Accessoires, Textiles, Personal Products, Food, Beverages, Catalog Retail, Luxury Goods, Internet Retail, General Merchandise	Retail
Energy, Oil and Gas Equipment, Energy Infrastructure, Utilities Equipment, Utilities Services	Utilities
Restaurants, hotels, leisure, Food, Beverage	Hospitality
Commercial Banks, Asset Management, Financial Services, Accounting, Insurance, Other Financial Services, Capital markets, International Banks, Audit and Tax Services, Audit and Tax Services	Financial Services & Insurance
Automotive, Education, Government, Agriculture, Forestry Processing	Other

Appendix X Regression TVPI Data Set

The following tables present the excel regression outputs for the Reduced Model and Selective Vintages (only pre-selected vintages) on a fund level. The dependent variable is always the TVPI and the regressions include different fund size definitions (size, quartiles or size classification).

REDUCED TVPI MODEL SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.76425500
R Square	0.58408570
Adjusted R Square	0.54641639
Standard Error	0.45521034
Observations	160

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	12	43.06839374	3.58903281	17.3202113	0.0000000
Residual	148	30.66803554	0.20721646		
Total	160	73.73642928			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Count of Geography Focus	0.0166634	0.0133942	1.2440734	0.2154393	(0.0098052)	0.0431320	(0.0098052)	0.0431320
Focus EU (1 if yes)	0.2026149	0.0930006	2.1786420	0.0309408	0.0188344	0.3863954	0.0188344	0.3863954
Focus US	(0.0738258)	0.0810600	(0.9107548)	0.3639055	(0.2340102)	0.0863587	(0.2340102)	0.0863587
At Least Partly GP Reporting	(0.0604127)	0.0797675	(0.7573598)	0.4500384	(0.2180431)	0.0972177	(0.2180431)	0.0972177
Count of Prior Funds	(0.0092683)	0.0089096	(1.0402627)	0.2999143	(0.0268748)	0.0083381	(0.0268748)	0.0083381
Count of Industry Focus	0.0095414	0.0331789	0.2875754	0.7740741	(0.0560241)	0.0751070	(0.0560241)	0.0751070
Vintages Bubble (1999,2000,2008,2009)	0.0990243	0.0826357	1.1983237	0.2327064	(0.0642740)	0.2623226	(0.0642740)	0.2623226
Large	0.4525402	0.1392505	3.2498291	0.0014295	0.1773642	0.7277161	0.1773642	0.7277161
Mid to Large	0.2091198	0.1356907	1.5411505	0.1254156	(0.0590217)	0.4772612	(0.0590217)	0.4772612
Mid	0.4311597	0.1161304	3.7127192	0.0002898	0.2016717	0.6606477	0.2016717	0.6606477
Mid To Small	0.5468835	0.1298518	4.2115976	0.0000439	0.2902804	0.8034865	0.2902804	0.8034865
Small	0.5759275	0.1267521	4.5437316	0.0000114	0.3254498	0.8264051	0.3254498	0.8264051

TVPI SUMMARY OUTPUT for Vintages 1998, 1999, 2000, 2001

Regression Statistics	
Multiple R	0.91305658
R Square	0.83367232
Adjusted R Square	0.81927622
Standard Error	0.84185585
Observations	196

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	11	657.1704638	59.7427694	84.2965654	0.0000000
Residual	185	131.1134362	0.70872128		
Total	196	788.2839			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Fund Size	0.0000825	0.0000847	0.9738156	0.3314197	(0.0000846)	0.0002495	(0.0000846)	0.0002495
Liquidation Dummy (1 if yes)	(0.0973424)	0.1288356	(0.7555550)	0.4508770	(0.3515183)	0.1568335	(0.3515183)	0.1568335
Count of Industry Focus	(0.0742703)	0.0668508	(1.1109870)	0.2680158	(0.2061582)	0.0576175	(0.2061582)	0.0576175
Count of Geography Focus	(0.0096329)	0.0213208	(0.4518063)	0.6519378	(0.0516960)	0.0324303	(0.0516960)	0.0324303
At Least Partly GP Reporting	0.0251594	0.1326410	0.1896805	0.8497675	(0.2365241)	0.2868429	(0.2365241)	0.2868429
First Fund For At Least One Investor	(0.0087593)	0.1639745	(0.0534187)	0.9574559	(0.3322597)	0.3147411	(0.3322597)	0.3147411
Count of Prior Funds	(0.0035670)	0.0149875	(0.2380004)	0.8121442	(0.0331355)	0.0260014	(0.0331355)	0.0260014
Q1	2.3649447	0.2081126	11.3637768	0.0000000	1.9543657	2.7755237	1.9543657	2.7755237
Q2	1.9367495	0.2005572	9.6568423	0.0000000	1.5410762	2.3324228	1.5410762	2.3324228
Q3	1.8286589	0.1832806	9.9773742	0.0000000	1.4670701	2.1902476	1.4670701	2.1902476
Q4	1.6941733	0.2653320	6.3851079	0.0000000	1.1707078	2.2176388	1.1707078	2.2176388

REDUCED TVPI MODEL SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.70940078
R Square	0.50324947
Adjusted R Square	0.47379385
Standard Error	0.49089480
Observations	160

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	8	37.10781873	4.63847734	19.248575	0.0000000
Residual	152	36.62861055	0.2409777		
Total	160	73.73642928			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Fund Size	0.0000042	0.0000530	0.0792419	0.9369444	(0.0001005)	0.0001088	(0.0001005)	0.0001088
Count Geography Focus	0.0244306	0.0139158	1.7556099	0.0811694	(0.0030626)	0.0519239	(0.0030626)	0.0519239
Focus EU (1 if yes)	0.3008536	0.0959616	3.1351463	0.0020622	0.1112629	0.4904443	0.1112629	0.4904443
Focus US	0.1297262	0.0729543	1.7781843	0.0773728	(0.0144092)	0.2738616	(0.0144092)	0.2738616
Calculations are at least partly based on GP Reporting	0.0535086	0.0815488	0.6561539	0.5127172	(0.1076069)	0.2146240	(0.1076069)	0.2146240
Count of Prior Funds	(0.0029167)	0.0096338	(0.3027539)	0.7624914	(0.0219500)	0.0161167	(0.0219500)	0.0161167
Count of Industry Focus	0.0868816	0.0306436	2.8352308	0.0052028	0.0263393	0.1474239	0.0263393	0.1474239
Vintages Bubble (1999,2000,2008,2009)	0.1804160	0.0857482	2.1040216	0.0370226	0.0110039	0.3498282	0.0110039	0.3498282

TVPI SUMMARY OUTPUT for Vintages 1998, 1999, 2000, 2001

Regression Statistics	
Multiple R	0.9212331
R Square	0.84867042
Adjusted R Square	0.83328269
Standard Error	0.80737946
Observations	196

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	13	668.9932274	51.4610175	78.9446987	0.0000000
Residual	183	119.2906726	0.6518616		
Total	196	788.2839			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Fund Size	0.0000417	0.0001147	0.3637733	0.7164472	(0.0001846)	0.0002681	(0.0001846)	0.0002681
Liquidation Dummy (1 if yes)	(0.1265486)	0.1241726	(1.0191345)	0.3094845	(0.3715426)	0.1184454	(0.3715426)	0.1184454
Count of Industry Focus	(0.0569306)	0.0642834	(0.8856184)	0.3769854	(0.1837625)	0.0699014	(0.1837625)	0.0699014
Count of Geography Focus	(0.0010011)	0.0212891	(0.0470234)	0.9625459	(0.0430047)	0.0410026	(0.0430047)	0.0410026
At Least Partly GP Reporting	0.0044644	0.1271222	0.0351187	0.9720234	(0.2463492)	0.2552779	(0.2463492)	0.2552779
First Fund For At Least One Investor	(0.0439992)	0.1617237	(0.2720640)	0.7858795	(0.3630820)	0.2750836	(0.3630820)	0.2750836
Count of Prior Funds	0.0012425	0.0144102	0.0862224	0.9313839	(0.0271890)	0.0296740	(0.0271890)	0.0296740
Mega	1.8033068	0.7551949	2.3878693	0.0179645	0.3132982	3.2933155	0.3132982	3.2933155
Large	1.7616298	0.3196513	5.5110991	0.0000001	1.1309540	2.3923055	1.1309540	2.3923055
Mid to Large	1.7291265	0.1965706	8.7964654	0.0000000	1.3412904	2.1169627	1.3412904	2.1169627
Mid	1.9289751	0.1937527	9.9558627	0.0000000	1.5466987	2.3112514	1.5466987	2.3112514
Mid To Small	1.8488018	0.2172064	8.5117263	0.0000000	1.4202509	2.2773527	1.4202509	2.2773527
Small	2.9320138	0.2416216	12.1347339	0.0000000	2.4552915	3.4087361	2.4552915	3.4087361

TVPI SUMMARY OUTPUT for Vintages 2006, 2007, 2008

Regression Statistics	
Multiple R	0.92587111
R Square	0.85723730
Adjusted R Square	0.84939582
Standard Error	0.65652083
Observations	359

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	13	895.4873184	68.8836399	159.815563	0.0000000
Residual	346	149.1327816	0.4310196		
Total	359	1044.6201			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Fund Size	0.0000086	0.0000244	0.3524266	0.7247330	(0.0000393)	0.0000565	(0.0000393)	0.0000565
Liquidation Dummy (1 if yes)	0.1883991	0.1965274	0.9586404	0.3384093	(0.1981396)	0.5749378	(0.1981396)	0.5749378
Count of Industry Focus	0.0161684	0.0323939	0.4991203	0.6180118	(0.0475453)	0.0798822	(0.0475453)	0.0798822
Count of Geography Focus	(0.0026036)	0.0056240	(0.4629548)	0.6436878	(0.0136651)	0.0084578	(0.0136651)	0.0084578
At Least Partly GP Reporting	0.0660569	0.0829304	0.7965349	0.4262674	(0.0970542)	0.2291681	(0.0970542)	0.2291681
First Fund For At Least One Investor	(0.2278082)	0.1073278	(2.1225455)	0.0345018	(0.4389053)	(0.0167111)	(0.4389053)	(0.0167111)
Count of Prior Funds	(0.0084849)	0.0047504	(1.7861429)	0.0749517	(0.0178282)	0.0008584	(0.0178282)	0.0008584
Mega	1.6177561	0.2622573	6.1685839	0.0000000	1.1019369	2.1335752	1.1019369	2.1335752
Large	1.5691191	0.1061623	14.7803829	0.0000000	1.3603145	1.7779238	1.3603145	1.7779238
Mid to Large	1.5379485	0.1010966	15.2126578	0.0000000	1.3391072	1.7367898	1.3391072	1.7367898
Mid	1.6668310	0.0929664	17.9293907	0.0000000	1.4839806	1.8496814	1.4839806	1.8496814
Mid To Small	1.4815226	0.1071832	13.8223422	0.0000000	1.2707101	1.6923352	1.2707101	1.6923352
Small	1.9507865	0.1705029	11.4413668	0.0000000	1.6154339	2.2861392	1.6154339	2.2861392

TVPI SUMMARY OUTPUT for Vintages 2006, 2007, 2008

Regression Statistics	
Multiple R	0.89372192
R Square	0.79873886
Adjusted R Square	0.79008193
Standard Error	0.77726574
Observations	359

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	11	834.3786711	75.8526065	125.55426	0.0000000
Residual	348	210.2414289	0.60414204		
Total	359	1044.6201			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Fund Size	0.0000037	0.0000159	0.2307366	0.8176550	(0.0000276)	0.0000350	(0.0000276)	0.0000350
Liquidation Dummy (1 if yes)	0.5215642	0.2316605	2.2514158	0.0249625	0.0659333	0.9771952	0.0659333	0.9771952
Count of Industry Focus	0.2389167	0.0449100	5.3198967	0.0000002	0.1505875	0.3272460	0.1505875	0.3272460
Count of Geography Focus	0.0126503	0.0065216	1.9397568	0.0532170	(0.0001764)	0.0254769	(0.0001764)	0.0254769
At Least Partly GP Reporting	0.1964924	0.0948380	2.0718733	0.0390135	0.0099645	0.3830203	0.0099645	0.3830203
First Fund For At Least One Investor	(0.0965349)	0.1212331	(0.7962752)	0.4264149	(0.3349766)	0.1419068	(0.3349766)	0.1419068
Count of Prior Funds	(0.0012815)	0.0055811	(0.2296182)	0.8185234	(0.0122585)	0.0096955	(0.0122585)	0.0096955
Q1	1.2167908	0.0823987	14.7671204	0.0000000	1.0547288	1.3788528	1.0547288	1.3788528
Q2	1.0471728	0.1275095	8.2125100	0.0000000	0.7963866	1.2979589	0.7963866	1.2979589
Q3	0.7525212	0.1978107	3.8042498	0.0001680	0.3634663	1.1415760	0.3634663	1.1415760
Q4	0.4390487	0.3439563	1.2764666	0.2026418	(0.2374460)	1.1155434	(0.2374460)	1.1155434

Appendix XI Survey on Fund sizes

The following pages are a replication of the survey I designed and published in Autumn 2019. The survey was created with Qualtrics and published via social platforms (posts and direct messages) and via email or personal messages.

Q0 Welcome to the Study!

It was only this year that Blackstone surpassed the $26bn mark, setting a signal to become the largest fund in history. This gives rise to support the standpoint that mega deals have tended to outperform its competitive sizes in the past. However, proponents of small- and mid-sized funds say that tilting towards smaller deals creates the most value for investors. One example this year has been the sale of 32 stores of French retailer Casino to Apollo Global for $529.03m. Certainly, size does have a great impact on returns. For my final project in my Master studies, I conduct a study on how FUND SIZE effects Private Equity fund performance. Next to the main part of my study, which is analyzing and comparing historical performance of PE BUYOUT FUNDS among different sizes, I am highly interested in giving a market outlook on what investors and the industry believe at the moment. What is YOUR best speculation? I appreciate any help from the industry in voluntarily and anonymously filling out my 4-minute questionnaire. EVERY CONTRIBUTION IS VALUABLE! A warm thank you, Marla

Q1 Your background:

- ○ M&A Advisor (1)
- ○ Consultant / Industry Expert (2)
- ○ Investment Professional (Fund / Asset Manager) (3)
- ○ Research Analyst (4)
- ○ Institution / HNW Individual (5)

Q2 I have worked in one of the above categories for:

- ○ Less than 1 year (1)
- ○ 1 - 6 years (2)
- ○ 7 - 10 years (3)
- ○ 11 - 15 years (4)
- ○ More than 15 years (5)

Q3 Your place of work:

- ○ Europe (1)
- ○ US (2)
- ○ Asia (3)
- ○ Other (4) _____

Q4 Which side of a transaction process are you more familiar with (e.g. if you work in M&A or as a consultant)?

- ○ Buy side (1)
- ○ Sell side (2)
- ○ Both equally familiar (3)

Q5 Please rank your risk aversion level.

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	
Risk taking	○	○	○	○	○	Risk averse

Q6 Your willingness to

Invest in Private Equity (1)	▼ Very high (1) ... Very low (5)
Invest in private Equity Buyout Fund (2)	▼ Very high (1) ... Very low (5)

Q7 What is your main reason not to invest in the asset class private equity? (Assume capital and access to the asset class are no impediments)

_____

Q8 If you had a large amount to make an investment for ten years, in which PE buyout fund would you most likely invest?

- ○ $99m (or smaller) fund (4)
- ○ $100-999m fund (3)
- ○ $1bn-5bn fund (2)
- ○ $5bn+ fund (1)
- ○ I cannot make a decision based on the given info. (5)

Q9 If you had a large amount to make an investment for three years, in which PE buyout fund would you most likely invest?

- ○ $5bn+ fund (1)
- ○ $1bn-5bn fund (2)
- ○ $100-999m fund (3)
- ○ $99m (or smaller) fund (4)
- ○ I cannot make a decision based on the given info. (5)

Q10 You chose 'I cannot make a decision' in at least one of the above questions, please briefly state a reason for your choice.

_____

Q11 Would your choice of fund size differ if the fund type would be different (not BO but e.g. VC fund)?

- ○ Yes, because the size effect cannot be generalized for each fund type. (1)
- ○ No, I would choose the same fund size for a different type of fund. (2)

Q12 Please rank the following return drivers according to importance.
_____ Regional focus (1)
_____ Size of fund (2)
_____ Industry focus (3)
_____ Fund manager (brand of GP) (4)

Q13 Given a new recession were to occur, please rank the below fund sizes according to expected proneness to the market downturn? (1 = most prone)
_____ Small funds ($0-$99m) (1)
_____ Mid funds ($100-999m) (2)
_____ Large funds ($1-$4.99bn) (3)
_____ Mega funds ($5bn+) (4)

Q14 Across all fund sizes, PE mega funds ($5bn+) perform the best.

- 0 (0)
- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10 (10)

Q15 I am a risk taker, therefore small funds offer me the best return opportunities.

- ○ 0 (0)
- ○ 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ 7 (7)
- ○ 8 (8)
- ○ 9 (9)
- ○ 10 (10)

Q16 Small- to mid-sized funds outperform larger buyout vehicles.

- ○ 0 (0)
- ○ 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ 7 (7)
- ○ 8 (8)
- ○ 9 (9)
- ○ 10 (10)

Q17 Small-sized funds have the highest return potential because they are the most volatile fund size (highest return dispersion).

- ○ 0 (0)
- ○ 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ 7 (7)
- ○ 8 (8)
- ○ 9 (9)
- ○ 10 (10)

Q18 There is no clear proof that buyout funds of one size outperform or underperform those of other sizes.

- ○ 0 (0)
- ○ 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ 7 (7)
- ○ 8 (8)
- ○ 9 (9)
- ○ 10 (10)

Q19 Of all fund sizes, mega funds are the most likely to move in accordance with the market.

- 0 (0)
- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10 (10)

Q20 Mega funds deploy capital slower than smaller funds. Increasing dry powder results in pressure on fund managers which in turn decreases fund performance.

- ○ 0 (0)
- ○ 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ 7 (7)
- ○ 8 (8)
- ○ 9 (9)
- ○ 10 (10)

Q21 Fund strategy does not matter, brand of GPs ultimately drive performance.

- ○ 0 (0)
- ○ 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ 7 (7)
- ○ 8 (8)
- ○ 9 (9)
- ○ 10 (10)

Q22 Past performance is no indicator for future happenings.

- 0 (0)
- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10 (10)

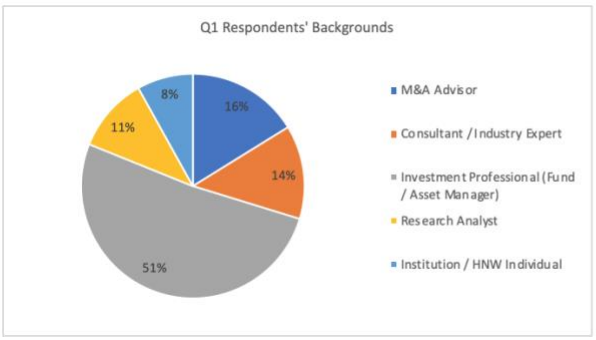
Q23 If you are keen to the results of the study, feel free to leave your email address and I will follow up with you.

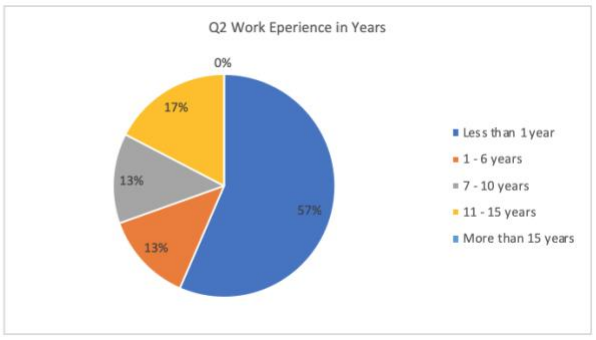
_____

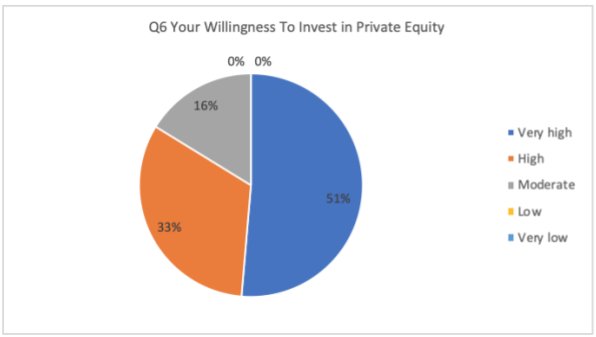
End of the survey

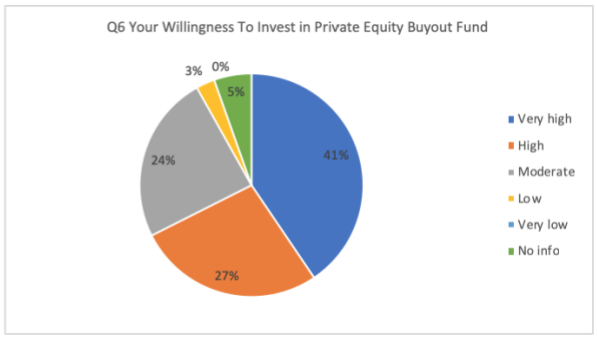
Appendix XII Survey Results

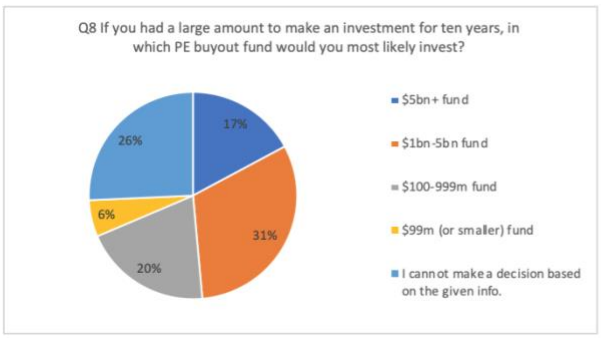
The following charts and tables summarize mostly in percentages the answers I received to the questions in the survey.

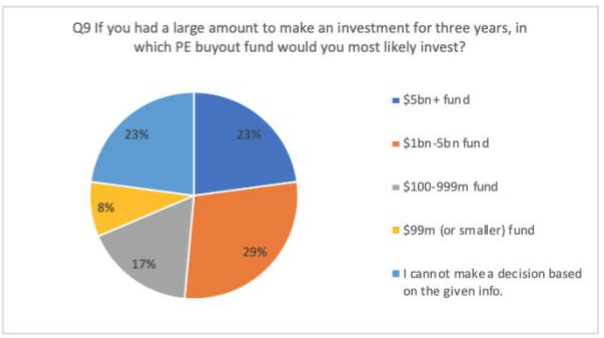


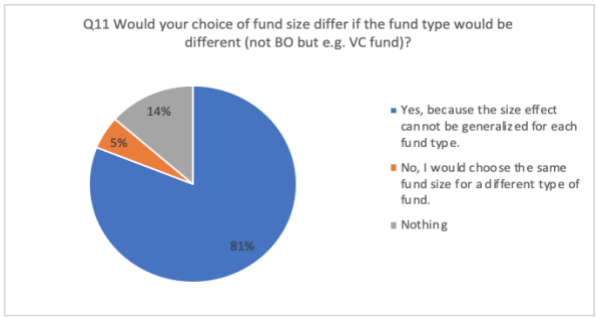












Q12 Please rank the following return drivers according to importance.

	Regional Focus		Size of Fund		Industry Focus		Fund Manager (Brand of GP)	
Most important	0	0%	1	3%	13	41%	18	56%
	8	25%	4	13%	13	41%	7	22%
	15	47%	10	31%	3	9%	4	13%
Least important	9	28%	17	53%	3	9%	3	9%

Q14 Across all fund sizes, PE mega funds ($5bn+) perform the best.

Agree	11
Neutral	7
Disagree	13

Q15 I am a risk taker, therefore small funds offer me the best return opportunities.

Agree	17
Neutral	2
Disagree	12

Q16 Small- to mid-sized funds outperform larger buyout vehicles.

Agree	18
Neutral	6
Disagree	6

Q17 Small-sized funds have the highest return potential because they are the most volatile fund size (highest return dispersion).

Agree	20
Neutral	5
Disagree	6

Q18 There is no clear proof that buyout funds of one size outperform or underperform those of other sizes.

Agree	17
Neutral	4
Disagree	4

Q19 Of all fund sizes, mega funds are the most likely to move in accordance with the market.

Agree	16
Neutral	2
Disagree	3

Q20 Mega funds deploy capital slower than smaller funds. Increasing dry powder results in pressure on fund managers which in turn decreases fund performance.

Agree	18
Neutral	6
Disagree	6

Q21 Fund strategy does not matter, brand of GPs ultimately drive performance.

Agree	9
Neutral	1
Disagree	18

Meaning	Scale
Agree	6 to 10
Neutral	5
Disagree	1 to 4