# Impact of Expected versus Unexpected Growth on Fund Performance

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## Abstract

Over the past two decades we see a dramatic increase in the fund flowing into private equity to over 3.9 trillion USD in 2019. In the same period the median fund size increase in a given fund family by 58%. This paper investigates the impact of this growth of subsequent fund performance. In a novel approach we differentiate fund growth into two sources: expected growth, the target fund size and at the time of fundraising known to investors. And unexpected growth, the part of the total fund growth unknown to investors and GP at the time of the start of the fundraising. Dividing fund growth in these categories, we show that the fund performance impact, as reported in prior literature, is negative impacted by large fund growth. Our paper can show that this negative performance is driven to a large degree by large unexpected fund growth compared to expected, cleary communicated fund growth. This unexpected growth has a significant negative, concave, relationship with fund performance. The negative impact of unexpected growth is in particular negative for mega funds (>$775mln), Buyout funds and EU focused funds.



JEL Codes D22; E22; G11; G23

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# 1 Introduction

Investments into private equity (PE) increased sharply in the past decades. In 1991 $10 billion was invested into PE (Kaplan & Schoar, 2005), while in 2019 total assets under management for PE amounted to $3.9 trillion (McKinsey & Company, 2020). This increase in assets under management is not only caused by an increase in the number of PE firms, but the fund sizes of PE firms also grew significantly.

Previous research investigated the effect of fund size on PE performance. Multiple prior research papers (Ljungqvist and Richardson, 2003; Higson and Stucke, 2012; Phalippou and Gottschalg, 2009; Kaplan and Schoar, 2005; Robinson and Sensoy, 2011) show that fund size positively affects fund returns, however they disagree on the functional form of the relationship. Kaplan and Schoar (2005) find the relationship to be concave, while Higson and Stucke (2012) and Phalippou and Gottschalg (2009) find the relationship to be linear. Larger PE funds might benefit through stronger connections with financial institutions (Hochberg, Ljungqvist, and Lu, 2007), the possibility to increase diversification (Cumming and Dai, 2010) and to negotiate better prices with portfolio companies (Cumming and Dai, 2011). On the contrary, Lopez-de Silanes et al. (2015) and Humphery-Jenner (2012) observe that large PE funds have lower performance than small PE funds. Returns would not be scalable by increasing the number of portfolio companies, it might be more difficult to transfer knowledge properly within large funds (Lopez-de-Silanes et al., 2015) and there might only be a limited number of valuable investment opportunities available (Kaplan and Schoar, 2005).

Although previous research investigated the effect of general growth of fund size on performance, we do not know which drives this underperformance and if the parties involved are aware of the extent of this growth at the time of fundraising (and its implication for the potential fund performance). This paper tries to fill this gap and contributes to the previous literature by building on the findings of Kaplan and Schoar (2005) and Robinson and Sensoy (2011. We hypothesize that the type of growth, effect expected versus unexpected growth, will have different impact on funds. Expected fund growth could positively affect performance as the general partners are able to prepare for the expected fund growth by for instance increasing their human capital. However, large unexpected growth (either positive or negative) could potentially harm future performance as there might not be enough valuable investment opportunities available or the decrease in fund size might be due to a bad reputation amongst limited partners. Therefore, differentiating between expected and unexpected growth provides valuable insights as this helps PE firms in setting an optimal growth path and helps limited partners to choose their investments in an optimal manner.

We use a dataset from Preqin which is manually extended with fund sequence and fund family categories. We define expected growth as the target fund size which is known and communicated to potential investors at the start of the fund raising process. Unexpected fund growth, on the other hand, is unknown to both LPs and GPs at the time of the fund raising and determined during the fund raising itself[1]. We define unexpected fund size as the difference between target fund size and actual raised fund size. The size of the fund at the final close can deviate significantly from the target fund size indicated by the GPs at the start of the fundraising. Our final dataset consists of 588 funds with vintage years ranging from 1988 until 2011, raised by 393 different PE firms.

Our results show that, in line with the findings of Kaplan and Schoar (2005) and Robinson and Sensoy (2011), fund growth for a particular PE firm negatively affects fund performance. When fund growth is divided into five different bins it is found that specifically large fund growth leads to lower performance. This finding appears to be robust to the choice of performance measure, when a stricter criterion for the investment period of funds is used or when the performance measure is winsorized.

In the next step, we look at the type of growth. Unexpected growth has a statistically significant negative effect on fund performance. As the squared term for unexpected growth is also negative and statistically significant, this provides evidence that when the unexpected growth gets very large the negative relationship between fund growth and performance becomes even stronger. This result is also found when the unexpected growth is divided into five different bins, as the bin with the largest unexpected growth significantly decreases performance. When the sample is divided into subgroups, specifically mega funds, Buyout funds and EU focused funds appear to have a strong negative relation between large unexpected growth and performance. On the other hand, for VC funds a certain degree of unexpected growth (up to 26.5%) is found to be beneficial for performance. Our robustness checks confirm this result. Applying stricter criteria for the investment period of funds is used, we find that already modest negative unexpected growth (unexpected growth between -25% and -1%) decreases performance.

On the other hand, we find that large expected growth leads to lower performance to a lesser degree. Dividing the sample in subgroups shows that large expected growth has

[1] We focus on funds with a soft cap target size. The target size is an indication and the actual fund size at the close can differ from it.

specifically a negative effect on performance for mega funds (>$775mln) and Buyout funds. For VC funds, expected growth (up to 66.6%) has a significant positive effect on performance.

The findings have important implications for both the general partners as well as the limited partners. Large unexpected growth has a significant negative effect on fund performance, general partners could prevent the fund from a large positive unexpected growth by implementing a hardcap. For limited partners these results suggest that investing in funds that do not expect to grow by a substantial amount and that maintain a hardcap would provide them with higher returns.

However, even large expected growth is bad for fund performance. General partners could anticipate on this by setting their target fund size not much higher than their previous fund size to avoid a subsequent decrease in fund performance.

This paper proceeds as follows. Section two provides a literature review that first explains more about the PE industry and the different performance measures that are used in prior research. Thereafter, the literature review discusses multiple potential determinants of PE performance. The third section outlines the hypotheses and the fourth section explains the data and the variables that are used throughout this paper. The fifth section explains the methodology, whereafter section six presents and discusses the results of the regressions. Section seven provides the results of the robustness checks and section eight presents the conclusions of the results. Lastly, section nine outlines the limitations of this paper and makes suggestions for future research.

# 2 Literature review

### 2.1.1 Fund size

Prior research investigated multiple determinants of PE fund performance, where fund size is suggested to be one of them. It can be seen as the total of by investors committed capital. Over the life of a fund the PE fund cannot ask more money from investors than the total capital that is committed to the fund. The committed capital is not transferred to the PE fund immediately. Instead, the PE fund can decide when they want to receive the committed capital, depending on the timing of their investments (Ljungqvist and Richardson, 2003).

Various research papers investigate the effect of fund size on PE fund returns, but the evidence remains inconclusive. Some prior research finds that fund size has a positive effect on fund performance, but is dispersed about the functional form of the relationship. Ljungqvist

and Richardson (2003) find the relationship to be an inverse U-shape, Higson and Stucke (2012) and Phalippou and Gottschalg (2009) find a linear effect and Kaplan and Schoar (2005) and Robinson and Sensoy (2011) find a concave relationship between fund size and returns. The concave relationship implies that larger funds have higher returns, but up to a certain point after which performance decreases. Large PE funds could have multiple advantages. First, through better connections with financial institutions, they might be able to arrange better deal terms with investment banks (Hochberg, Ljungqvist, and Lu, 2007). Second, as explained by Cumming and Dai (2010) they might have a better possibility to diversify at an international level. Third, Cumming and Dai (2011) find that larger VC funds can negotiate better prices with portfolio companies, as large funds are attractive to entrepreneurs given the fact that they have 'deep pockets'. These deep pockets would enable entrepreneurs to potentially raise higher investment amounts and would decrease financing risk when they are looking for follow-on funding, which could make the entrepreneurs more willing to accept lower valuations.

In contrast to previously mentioned findings, Humphery-Jenner (2012) and Lopez-de Silanes et al. (2015) find that large PE funds have lower performance than small PE funds. When Humphery-Jenner (2012) looks for an explanation for this size effect, he finds that large funds have lower performance especially if they make investments into small companies. Lopez-de-Silanes et al. (2015) find that performance of PE funds is not scalable by increasing the number of investments. Also, when Kaplan and Schoar (2005) look at a particular PE firm that increases fund size compared to the previous fund, they find that fund returns decrease for that PE firm. So, although they find that larger funds have better returns in the cross-section up to a certain point, this is not the case if they look at a particular PE firm. Robinson and Sensoy (2011) also find a negative effect of within-family fund size growth on subsequent performance. According to Kaplan and Lerner (2010) "fund size is the enemy of persistence" (p.43), where a fund size increase makes it hard to repeat good returns.

The relationship between the size of a fund and prior performance is also analysed. Kaplan and Schoar (2005) find that fund size has a significant concave relationship with the return of the previous as well as the second previous fund. This concave relationship indicates that lower performing funds grow more than proportionally with the rise in performance than the better performing funds do. As limited partners often state that the better performing funds are all greatly oversubscribed, this finding could indicate that top performing funds stay small on a voluntary basis (Hochberg, Ljungqvist, and Vissing-Jørgensen, 2014; Kaplan and Schoar, 2005). There could be multiple reasons for a PE firm to keep their fund size voluntarily small. First, from a demand side point of view, it could be the case that there are only a limited number

of valuable investment opportunities in the economy available. If a particular PE firm believes that they might face diseconomies of scope, it is in their advantage to keep their fund smaller (Kaplan and Schoar, 2005). Second, from a supply side point of view, top performing funds could experience constraints if they are not able to upscale their human capital and when new, competent individual employees are not readily available (Kaplan and Schoar, 2005). If these larger funds have to reduce the number of staff per portfolio company due to the constraints on human capital, this could lead to value destruction caused by decreased attention to portfolio companies. As PE firms often add value by optimizing the operations of a portfolio company, then larger funds will have a disadvantage (Lopez-de-Silanes et al., 2015). Third, organizational aspects related with the firm's structure could have an influence on the possibility to upscale returns. Although larger firms could have a benefit on the field of learning by obtaining information of better quality and by achieving a larger supply of knowledge, it may be harder for them to transfer knowledge properly (Lopez-de-Silanes et al., 2015).

Another potential explanation for worse performance of large funds could be explained by a study done by Degeorge, Martin and Phalippou (2016). When they study the performance of secondary buyouts (SBOs), they find that secondary buyouts made at the end of the fund's investment period perform worse than other buyouts and that these late SBOs are value destroying for investors. PE funds engage in these late SBOs as they only earn fees on the part of the capital that is invested, Also, it is more difficult for PE funds to raise a new fund if the current fund still has a high amount of unspent capital. If a PE firm raises a much larger fund, they could end up with a higher amount of uninvested capital (also known as "dry-powder") and therefore they could potentially engage in more value destroying SBOs subsequently decreasing their overall performance.

Lastly, based on Jensen's (1986) hypothesis of free cash flow, Cumming and Dai (2011) provide evidence that there might exist an agency problem within the VC industry. Fund managers could let a fund become too large in order to receive more perquisites and gain prestige. This could cause investments in unprofitable firms, reducing fund returns.

In summary, it is clear that fund size is one of the determinants of fund performance. However, previous literature is still divided about the precise relationship between fund size and performance. Also, most studies focus on the relationship between fund size and performance in the cross-section and only limited research has been done into the effect of fund growth on performance for a particular PE firm. As investments into the PE industry are rising strongly and many funds are growing substantially, it is therefore beneficial to extend the research into the effect of fund growth on fund performance for a particular PE firm. To build

up on this research, the effect of fund growth can further be investigated by differentiating between expected versus unexpected growth as these two different types of growth could have a significant different effect on fund performance. This differentiation has not been made in previous research. Therefore, this paper aims to contribute to prior research by looking into the effect of fund growth on performance for a particular PE firm and deepens on this relationship by differentiating the amount of expected versus unexpected growth.

### 2.1.2 The aggregate amount of capital inflow

Another determinant of fund performance is the aggregate amount of capital inflow into a specific PE class. Kaplan and Strömberg (2009) and Harris, Jenkinson & Kaplan (2014) find that an increase in capital inflow into PE funds in a specific year has a negative effect on vintage year fund returns in the subsequent year. A potential explanation for this result is that the funds raised in boom years have difficulties exiting their investments at prices as high as they have paid during these boom years. Perhaps the deals during boom years were more driven by a higher availability of debt financing and better financing terms instead of the potential value of the investment, which could cause the lower returns (Kaplan and Strömberg, 2009). Gompers and Lerner (2000) provide evidence that VC firms pay higher prices at times of an increased inflow of capital in the VC sector, while controlling for investment opportunities. Competition for potential investment opportunities increases valuations, which has an effect on the quality of the investments of VC firms and consequently their returns (Hochberg, Ljungqvist and Lu, 2007).

Robinson and Sensoy (2011) also find a negative relation between inflow of capital and subsequent vintage year fund returns if they measure performance by TVPI, however if they measure performance with PMEs this relation disappears. This finding means that funds raised in years with a high capital inflow might have low returns, but the public market has low performance in the same time period as well. Robinson and Sensoy (2011) extend their findings by looking at the variation of the above conclusions in different terciles of fund size. They argue that when funds grow larger with an increased inflow of capital and if it is the case that larger funds have lower performance, they should observe specifically bad performance among the biggest funds during boom cycles. Robinson and Sensoy (2011) indeed find that the relation between industry capital inflow and TVPI is much stronger in the upper tercile, which means that the negative relation between the inflow of capital and subsequent returns is mainly caused by funds that get bigger in periods of boom and which have subsequently lower returns. The above findings could possibly be explained by the phenomenon of “money chasing deals”

described in the paper of Gompers and Lerner (2000). They find that capital inflow into the VC industry causes a rise in the valuation of PE investments, however the success of these acquisitions is not increasing. Therefore, this money chasing deal phenomenon could cause lower returns (Diller and Kaserer, 2009).

### 2.1.3 Vintage year

Kaplan & Strömberg (2009) find patterns that are coherent with periods of boom and bust. When they assess the effect of the performance of all PE funds in a given year on capital commitments into the PE industry in the subsequent year, they find a positive relation. This means that high PE performance in the previous year increases the capital committed to PE funds in the subsequent year. As capital commitments into PE are positively related to previous year performance and, as discussed in the previous section, performance is negatively related to previous year inflow of capital, Kaplan and Strömberg (2009) determine that the PE industry is subject to boom and bust cycles.

### 2.1.4 Fund Sequence

Prior research finds that fund sequence also has an effect on fund performance, as it might enclose important information on the ability of general partners to enhance the performance of their funds due to the experience they gained in managing previous funds. Kaplan and Schoar (2005) find that in the cross-section, later sequence funds have better returns and a higher chance of surviving the bad returns of a specific fund. Cumming, Fleming and Schwienbacher (2009) also provide evidence that funds with higher fund sequence numbers have higher performance, which they proxy by the amount of IPO exits that are successfully completed. Phalippou and Gottschalg (2009) find that first funds in a sequence have lower performance.

### 2.1.5 Performance persistence

Another aspect analysed in prior research is fund performance persistence. Kaplan and Schoar (2005) find strong evidence for fund persistence that is not caused by either time or investment overlap. So, this means that subsequent fund returns have a significant relation to previous fund returns for an individual PE firm, meaning that better PE firms consistently outperform other PE firms. According to Hochberg, Ljungqvist, and Lu (2007) this persistence could be caused by previously gained experience and investment expertise. This is an interesting finding, as there has no or limited evidence been found in other asset classes such as mutual and hedge funds (Kaplan and Lerner, 2010). Phalippou and Gottschalg (2009) confirm the findings of

performance persistence found by Kaplan and Schoar (2005) and argue that performance of the previous fund is an important variable for explaining the performance of the subsequent fund.

Robinson and Sensoy (2011) also find performance persistence, however their coefficients weaken after the sample period that has been used by Kaplan and Schoar (2005), which could, according to Robinson and Sensoy (2011), potentially be caused by the increase in competition and the increase in the amount of capital within the PE industry. When Braun, Jenkinson and Stoff (2017) analyse fund performance persistence with new deal-level data, they find that this previous found persistence has largely declined due to the maturation of the PE industry and a rise in competition. However, they still provide evidence for the persistence of performance within the top and bottom performing funds.

### 2.1.6 Region Focus

Hege, Palomino and Schwienbacher (2009) provide evidence that the VC industry in the US significantly performs better than the VC industry in Europe. They argue that this performance difference might be caused by relationship differences between VC portfolio companies and VC firms, such as for example the frequency of nurturing or the amount of funding. In line with these findings, Phalippou and Gottschalg (2009) also find that US focused PE funds significantly outperform PE funds that are focused on Europe.

## 3 Hypotheses

As described in the literature review in section 2, previous research discusses several aspects of the relationship between fund size and performance, however only little research has been done into the effect of fund growth on returns. Fund growth could have a positive effect on fund performance if getting larger improves a PE firm's connections with financial institutions, enabling the PE fund to arrange better deal terms with investment banks (Hochberg, Ljungqvist, and Lu, 2007). Also, larger funds could potentially negotiate better prices with portfolio companies, as large funds are attractive to entrepreneurs given the fact that they have 'deep pockets' (Cumming and Dai, 2011). Lastly, increasing the fund size might enable a PE fund to diversify more (Cumming and Dai, 2010).

When Kaplan and Schoar (2005) look at the effect of an increase in fund size on fund returns for a specific PE firm, they find a negative correlation. Also, they show that lower performing funds grow more than proportionally with the rise in performance than the better

performing funds do, which could indicate that better performing funds choose to stay small voluntarily. These findings indicate that fund growth for a particular fund could be harmful for future performance. If there are only a limited amount of profitable deals available in the economy, a fund that experiences high fund growth might has to move into regions with lower returns. Also, funds might experience constraints if they cannot easily upscale their human capital and when it is hard to attract new competent individual employees (Kaplan and Schoar, 2005). This could lead to a reduction in staff per portfolio company and therefore to a limited attention problem (Lopez-de-Silanes et al., 2015). Also, a large growth in fund size might be subject to an agency problem where managing partners could let a fund become inefficiently large to receive more perquisites and gain prestige. This will lead to investments in unprofitable firms, and subsequently a decrease in returns. (Cumming and Dai, 2011).

In contrast to a positive growth in fund size, funds could also experience a decrease in fund size. A large decrease in fund size could be an indication of a lack in confidence in the PE firm by the limited partners, which might be caused by unsatisfying past returns or a bad reputation of the PE firm. If a fund experiences a large decrease in fund size it might be more difficult for them to diversify internationally and harder to negotiate better prices with portfolio companies, which could also lead to a subsequent decrease in fund performance.

Based on the above-mentioned studies it is hypothesized that the relationship between fund growth and performance is not linear. Fund growth might be good to a certain extent, but if a fund grows too much this could be caused by an agency problem or lead to a limited attention problem or diseconomies of scope. On the other hand, a large decrease in fund size might also have a negative effect on subsequent fund performance. Therefore, the first hypothesis is as follows:

**Hypothesis 1:** *There is a non-linear relationship between fund growth and the change in fund performance.*

To build up on the first hypothesis, the amount of realized fund growth is divided into expected and unexpected growth to analyse whether there is a different effect on performance if the fund growth was expected versus unexpected. Funds will likely set their target fund size at such a size that enables them to achieve the highest possible returns. By setting the target size they will likely take in consideration whether the necessary upscale in human capital could be achieved and if there would be enough profitable deals available in the economy to prevent the fund from moving into regions with lower returns. However, if the target fund size is set much

higher than the previous fund size, this could also be an indication of an agency problem where fund managers let a fund become too large in order to receive more perquisites and gain prestige (Cumming and Dai, 2011). Hence, the second hypothesis is as follows:

**Hypothesis 2:** *Expected fund growth has a positive effect on the change in fund performance*

Although funds set a target fund size for their funds, the realized fund size is often not equal to this target size. If a fund raises a lot more capital than they expected, this could cause implications as a fund might not be prepared for the "unexpected" growth in fund size. To spend the additional raised capital, funds might have to undertake deals that might be too big for them and which are out of the comfort zone for the general partners. Or, instead of undertaking larger deals, funds could increase the number of deals. However, when a PE firm faces constraints in upscaling their human capital in line with the increase in the number of deals this would decrease the number of staff members per portfolio company and could therefore lead to a limited attention problem (Lopez-de-Silanes et al., 2015). Also, a fund might have to move into regions with lower returns if there are not enough profitable deals available within the economy (Kaplan and Schoar, 2005). Therefore, both increasing the size of a deal as well as increasing the number of deals could potentially lead to a decrease in fund returns. On the other hand, a fund might also experience negative unexpected growth, meaning that a fund raises less capital than expected. This might be an indication that the limited partners do not trust the quality of the general partners, which could be caused by poor previous returns or a bad reputation of the firm. Hence, the third hypothesis is as follows:

**Hypothesis 3:** *Large unexpected growth has a negative effect on the change in fund performance.*

# 4 Data & Variables

## 4.1 Data

In this paper a data set from Preqin is used, which includes worldwide information on PE funds, PE firms and PE fund performance. Preqin collects publicly available data and makes direct requests to public institutional investors to share information voluntary (Brown, Harris, Jenkinson, Kaplan & Robinson, 2015). The database covers over 70% of all funds that have historically been raised. Within this database key information metrics could be find such as the Net IRR, realized fund size, target fund size, a fund's hard cap, vintage year and interim closes.

Sometimes researchers question the quality of the data from Preqin as the data could be subject to performance selection bias, as funds often report voluntary and therefore could be induced to report more positive returns. However, by comparing data sets obtained from different databases, Harris, Jenkinson & Kaplan (2014) find results that are similar in both a quantitative and qualitative way. Therefore, in this paper I assume that Preqin does not contain any performance selection bias. The Preqin data set is manually extended with a variable indicating to which fund family a fund belongs and another variable indicating the fund sequence number within a fund family.

Initially the full sample contains 7,948 funds raised between 1969 and 2016 and does not only include information on PE funds, but also on other types of funds such as "Real Estate" and "Natural Resources". Funds for which no fund size growth rate could be calculated or funds that have missing data on the Net IRR or Benchmarked Net IRR are dropped from the sample. Also, as is done in Kaplan and Schoar (2005), funds with a fund size smaller than 5 million USD are excluded from the sample to focus only on funds that are economically relevant. After these steps the sample contains observations on 2,685 funds. Hereafter, as the focus in this paper is on PE funds, funds that could not be classified as "Buyout fund" or "VC fund" are dropped from the sample. Funds are attributed to the Buyout fund type if the funds are classified in the database as Buyout, Mezzanine, Expansion / Late Stage, and Balanced. Funds are attributed to the VC fund type if the funds are classified in the database as Early Stage, Early Stage: Seed, Early Stage: Start-up, Venture (General) and Venture Debt. All funds that do not fall under any of these classifications are therefore dropped from the sample. Lastly, only funds that have an investment period of at least 5 years and funds that have no missing values for Target Fund Size are included in the sample. This results in a final sample of 588 funds raised by 393 different PE firms with vintage years ranging from 1988 until 2011.

The database is a worldwide sample, but most funds are focused on the United States (70.1%) followed by Europe (22.1%). In columns 2 and 3 of Table 1 the number of funds per vintage year and investment type are displayed. Roughly 67% of the funds in the final sample are Buyout funds and 33% are VC funds. Also, it could be seen that from the year 2000 the number of observations increases significantly. Columns 4-6 show the average fund sizes per vintage year for all funds, Buyout funds and VC funds respectively. First of all, it could be seen that average fund sizes of Buyout as well as VC funds have increased considerably over the years. Also, from this table it could be seen that the fund sizes of Buyout funds are much larger

**Table 1**

**Descriptive Statistics**

This table shows descriptive statistics about the final sample that is used. In columns 2 and 3, the number of funds in the sample per vintage year per fund type are showed. In columns 4 – 6, the average fund sizes per vintage year are shown for all funds, Buyout funds and VC funds respectively. The fund size is measured as the realized fund size of a fund in millions of US dollars. Columns 7 – 9 show the average target fund sizes per vintage year for all funds, Buyout funds and VC funds respectively. The fund size is measured as the realized fund size and target fund size is measured as the target fund size of a fund. Both fund size and target fund size are stated in millions of US dollars.

| | Number of Funds | | Average Fund Size | | | Average Target Fund Size | | |
|---|---|---|---|---|---|---|---|---|
| Vintage Year | Buyout Funds | VC Funds | All Funds | Buyout Funds | VC Funds | All Funds | Buyout Funds | VC Funds |
| 1988 | 0 | 1 | 100 | | 100 | 100 | | 100 |
| 1990 | 0 | 1 | 63 | | 63 | 63 | | 63 |
| 1991 | 0 | 1 | 102 | | 102 | 100 | | 100 |
| 1994 | 1 | 1 | 284.5 | 530.6 | 38.4 | 285.3 | 530.6 | 40 |
| 1995 | 0 | 1 | 100 | | 100 | 100 | | 100 |
| 1996 | 0 | 1 | 108 | | 108 | 100 | | 100 |
| 1997 | 1 | 1 | 322.5 | 581 | 63.9 | 230 | 400 | 60 |
| 1998 | 1 | 2 | 135.4 | 225 | 90.55 | 186.7 | 400 | 80 |
| 1999 | 1 | 5 | 268.8 | 315 | 259.6 | 247.5 | 400 | 217 |
| 2000 | 11 | 8 | 1,217.5 | 1,780.3 | 443.6 | 1,031.6 | 1,490 | 401.3 |
| 2001 | 12 | 12 | 826.8 | 1,333.1 | 320.6 | 827.9 | 1,370.7 | 285.2 |
| 2002 | 11 | 4 | 873 | 1,129.3 | 168.3 | 769.9 | 986.3 | 175 |
| 2003 | 24 | 10 | 1,035.4 | 1,372.2 | 227.2 | 957.7 | 1,265.8 | 218.1 |
| 2004 | 24 | 11 | 1039.7 | 1,373.7 | 311 | 982.2 | 1,294.3 | 301.2 |
| 2005 | 66 | 17 | 1,143 | 1.372 | 254.1 | 1,007.9 | 1,198.8 | 266.4 |
| 2006 | 66 | 30 | 1,654.3 | 2,215.6 | 419.5 | 1,397.2 | 1,840.1 | 422.9 |
| 2007 | 60 | 28 | 2,421.3 | 3,414.6 | 292.6 | 2,073.5 | 2,912.6 | 275.2 |
| 2008 | 56 | 34 | 1,689.3 | 2,519.5 | 321.8 | 1,746.8 | 2,601.4 | 339.1 |
| 2009 | 24 | 13 | 1,122.6 | 1,489.9 | 444.6 | 1,154.3 | 1,507.5 | 502.3 |
| 2010 | 36 | 12 | 655.3 | 772.7 | 303.4 | 634.9 | 716.5 | 390 |
| 2011 | 1 | 0 | 2,001 | 2,001.1 | | 2,118.3 | 2,118.3 | |
| No. of Observations | 395 | 193 | 588 | 395 | 193 | 588 | 395 | 193 |

than that from VC funds. Columns 7 – 9 show the average target fund sizes. Here a similar pattern could be observed as with average realized fund sizes. Target fund sizes have increased considerably over the years, and target fund sizes are also greater for Buyout funds than for VC funds.

In Table 2 the summary statistics are showed for the main variables that are used in the regression analyses. It shows that funds grow on average 77.2% from one fund to the next. The median of expected fund growth is 48.8% and the average is even higher at 69.8%. This

indicates that many funds expect to grow considerably. The average unexpected fund growth in the sample is 6.6%, which indicates that overall funds in the sample grew more than they expected. Figure 1, 2 and 3 (*Appendix 1*) show the histograms for the variables Fund Growth, Expected Fund Growth and Unexpected Fund Growth. Furthermore, large differences could be observed in the sample for fund sizes. To demonstrate, the smallest fund only raised 5.1

**Table 2**

**Descriptive Statistics**

This table provides summary statistics for the key variables that are used throughout this paper. The final sample contains 588 observations. Fund growth is measured as the percentage change between two subsequent funds. Expected Fund Growth shows the growth that a PE firm expects between two subsequent funds and is measured as a percentage. Unexpected Fund Growth is the part of the fund growth that was not expected by the PE firm and is also measured as a percentage. Net IRR and Benchmarked Net IRR are the internal rates of return of a fund excluding fees, where the Benchmarked Net IRR is benchmarked against the appropriate benchmark. Change in Net IRR and Change in Benchmarked Net IRR are measured as the percentage point changes in Net IRR and Benchmarked Net IRR between two subsequent funds. The fund size is measured as the realized fund size of the fund in millions of US dollars. Fund Sequence Firm is the fund sequence number of all the funds raised by the firm. Fund Sequence Family is the fund sequence number of a fund within a particular fund family. Capital Inflow is the aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year and in millions of US dollars.

| Variables | No. | Min | First quartile | Median | Third quartile | Max | Mean | Standard Deviation |
|---|---|---|---|---|---|---|---|---|
| Fund Growth | 588 | -93.1 | 14.3 | 58.8 | 113.3 | 1,067 | 77.2 | 105.9 |
| Expected Fund Growth | 588 | -93.1 | 15.8 | 48.2 | 99.9 | 900 | 69.8 | 97.6 |
| Unexpected Fund Growth | 588 | -282.3 | -10.0 | 6.6 | 30.5 | 351.3 | 7.4 | 55.4 |
| Net IRR | 588 | -32.3 | 5.3 | 10.5 | 17.8 | 102.2 | 12.1 | 14.0 |
| Benchmarked Net IRR | 588 | -43.6 | -5.6 | -0.1 | 4.9 | 82.5 | 0.6 | 12.1 |
| Change Net IRR | 588 | -219.3 | -10.4 | 0.3 | 8.8 | 103.7 | -1.1 | 22.0 |
| Change Benchmarked Net IRR | 588 | -200.3 | -8.8 | -0.6 | 6.6 | 86.6 | -1.4 | 19.8 |
| Fund Size | 588 | 5.1 | 226.0 | 500 | 1,168 | 20,365 | 1,403 | 2,654 |
| Fund Sequence Firm | 588 | 2 | 3 | 4 | 6 | 47 | 5.4 | 5.0 |
| Capital inflow | 588 | 750 | 22,358 | 56,362 | 197,517 | 268,812 | 110,022 | 95,456 |

million US dollars where the largest fund raised 20,365 million US dollars. As the mean fund size is also more than twice as big as the median fund size, this could indicate that there are also some large outliers within fund size. Then, by looking at fund sequence it could be seen that a PE firm raises on average 5.4 funds. In the final sample that is used throughout this paper there are no observations for first funds in the sequence, because it is not possible to calculate growth rates for these funds and the funds are therefore dropped from the sample. Lastly, the

large differences in aggregate inflow into the industry could be explained by the fact that in the earlier vintage years the PE sector was an emerging sector with not yet much capital flowing in. The PE industry rose significantly from the 1990s, which increased the capital flowing in.

Table 3 (*Appendix 2*) provides summary statistics for some of the variables showed in Table 2, but here the statistics are shown separately for Buyout and VC funds and then for funds focused on the US, EU or on other regions of the world. In the table it can be seen that Buyout funds expect to grow much more than VC funds. Also, by looking at the median of unexpected growth for both fund types it can be seen that Buyout funds experience much higher unexpected growth (13% versus 0% for VC funds). By looking at the mean of unexpected growth, VC funds even have a negative unexpected growth rate, indicating that their realized fund sizes are on average smaller than they expect beforehand.

Then, by looking at differences in the region focus of funds it could be observed that funds focused on the US expect much lower growth than funds that are focused on Europe or on other regions of the world. By looking at the unexpected fund growth, funds focused on other regions of the world have a considerably higher mean and median than funds focused on the US or Europe.

# 5 Methodology

This section describes the research methodology used throughout this paper. Multiple OLS regressions are used to analyse the effect of fund growth on performance. Fund growth, expected fund growth and unexpected fund growth are divided into five different bins to examine any non-linear relation. In additional regressions, the main sample is divided into different subgroups to analyse if there is any difference in the relationship between fund growth and performance within these subgroups.

## 5.1 Regression analyses

### 5.1.1 Fund growth and the change in fund performance

To test the first hypothesis that there is a non-linear relationship between fund growth and the change in fund performance, the following OLS regression model is used:

$$\begin{aligned} Change\ Perf_i = {} & \alpha_i + \beta_1 Fund\ Growth_i + \beta_2 Fund\ Size_i + \beta_3 VC\ Dummy_i \\ & + \beta_4 Performance_{i-1} + \beta_5 Capital\ Inflow_{it} + \beta_6 Fund\ Sequence\ Firm_i \\ & + \beta_7 Vintage_i + \beta_8 RegionFocus_i + \varepsilon_i \end{aligned}$$

where $Change\ Perf_i$ measures the percentage point change in Net IRR or Benchmarked Net IRR between two subsequent funds, and $i$ is the particular PE fund. $Fund\ Growth_i$ is the growth of a fund between two subsequent funds measured as a percentage. In most regressions the variable is divided into five different bins, where one bin is left out of the regression to avoid the dummy variable trap. The bins are created as follows: Bin 1: Less than 2.1%, Bin 2: 2.1% to 44.4%, Bin 3: 44.4% to 75.1%, Bin 4: 75.1% to 128.7 %, Bin 5: more than 128.7%. $Fund\ Size_i$ is the realized fund size of the fund, and is included in the regression as a logarithm to make its distribution more normally distributed. $VC\ Dummy_i$ is a dummy variable that takes on the value of one if the fund is a VC firm, and zero otherwise. $Performance_{i-1}$ is the performance of the previous fund in the same fund family. $Capital\ Inflow_{it}$ is the aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year, and is included as a logarithm to make its distribution more normally distributed. $Fund\ Sequence\ Firm_i$ is the fund sequence number of all the funds raised by the firm, and is also included as a logarithm as this was also done by Kaplan and Schoar (2005). Lastly, $Vintage_i$ and $RegionFocus_i$ are year-fixed and location-fixed effects respectively. The year fixed effects control for global economic fluctuations such as financial crises and changes in world market valuations. Location fixed effects are included to control for potential differences between different parts of the world. By adding these fixed effects potential endogeneity issues and omitted variable bias are tackled.

### 5.1.2 Expected and unexpected fund growth and performance

To test the second hypothesis that expected fund growth has a positive effect on fund performance up to a certain point, after which the relation is negative, and the third hypothesis that unexpected growth has a negative effect on the change in fund performance the following regression analysis is used:

$$\begin{aligned} Change\ Perf_i = {} & \alpha_i + \beta_1 Expected\ Fund\ Growth_i + \beta_2 Unexpected\ Fund\ Growth_i \\ & + \beta_3 Fund\ Size_i + \beta_4 VC\ Dummy_i + \beta_5 Performance_{i-1} \\ & + \beta_6 Capital\ Inflow_{it} + \beta_7 Fund\ Sequence\ Firm_i \\ & + \beta_8 Vintage_i + \beta_9 RegionFocus_i + \varepsilon_i \end{aligned}$$

The variables used here are the same as the variables used to test hypothesis 1, however the variable $Fund\ Growth_i$ is now replaced for $Expected\ Fund\ Growth_i$ and $Unexpected\ Fund\ Growth_i$. In most regressions the variables $Expected\ Fund\ Growth_i$ and $Unexpected\ Fund\ Growth_i$ are divided into five different bins. $Expected\ Fund\ Growth_i$ is divided into bins as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8 %, Bin 5: more than 112.8%. The bins for $Unexpected\ Fund\ Growth_i$ are as follows: Bin 1: Less than -25%, Bin 2: -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5 %, Bin 5: more than 26.5%.

### 5.2 Robustness Checks

This section briefly outlines the various robustness checks that are performed in this paper to check whether the results are not driven by the choice of performance measure, by inconclusive performance results or by any large outliers in the performance measures.

The first robustness check is done by using the multiple as a measure of performance instead of the Net IRR / Benchmarked Net IRR. As the multiple is calculated by adding the distributions to paid-in-capital (DPI) to the residual value to paid-in-capital (RVPI) and the Net IRR and Benchmarked Net IRR are calculated with a fund's cashflows, it is interesting to see if these different measures provide the same results.

In the second robustness check only funds are included in the regressions that have invested for 8 years (instead of the 5-year investment criterion that is used for the main sample). Extending the investment period criterium is done to make sure that the funds that are used in the sample are not investing anymore and that the given performance could be seen as the final performance of the fund. If funds included in the sample would still be investing, their performance measure would just give an update of their performance until the last observation date but might change significantly after they have liquidated all their investments. Therefore, extending the investment period checks if the results are not biased by funds that might still be investing and therefore do not provide the ultimate fund's performance.

Lastly, the performance measures are winsorized at 1% and 5% to check whether the results are not driven by any large outliers.

## 6 Results

In this section the hypotheses are tested using the methodology outlined in the prior section. For all regressions robust standard errors are used to account for heteroskedasticity.

### 6.1 The effect of fund growth on fund performance

To assess the effect of fund growth on fund performance multiple OLS regressions are performed and the results can be found in Table 6. The main variable of interest is "Fund Growth", which is divided into five different bins in specifications (1) until (6). The first four bins perform significantly better than the 5$^{th}$ bin, which is left out of the regression and therefore is the reference level. Thus, less growth leads to better returns. In specification (5) and (6), both region fixed effects and year fixed effects are included. By adding fixed effects to the regression the R-squared increases and the point estimates on the fund growth bins decrease slightly, however they remain positive and significant. Also, when "Change Benchmarked Net IRR" is used as the dependent variable instead of "Change Net IRR", the point estimates of the coefficients are a bit lower and some terms are only statistically significant at a 5% level where they are statistically significant at a 1% level if "Change Net IRR" is used as dependent variable. As shown in specification (5), a fund within bin 1 has an 8.4 percentage point higher positive change in fund performance than a fund that falls within bin 5, significant at a 1% level. In specification (7) and (8) of Table 6, the fund growth variable is not divided into bins but included as a linear and a squared term. The linear fund growth term is negative and significant, indicating that an increase in fund size decreases the performance of the subsequent fund. In specification (7) a 1% increase in fund growth leads to a 0.0401 percentage point decrease in the Net IRR of the subsequent fund. These findings are consistent with the findings of Kaplan and Schoar (2005) and Robinson and Sensoy (2011), who also find a negative relationship between an increase in fund size and subsequent fund returns for a specific PE firm.

**Table 6**

This table displays the results of OLS regressions. The dependent variables are Change Net IRR and Change Benchmarked Net IRR. Change Net IRR and Change Benchmarked Net IRR is the percentage point difference in the Net IRR or Benchmarked Net IRR between two subsequent funds. Fund Growth is the growth rate between the realized fund size of a fund and the previous fund size of a fund within the same fund family. In specifications (1) – (6) fund growth is divided in the following bins: Bin 1: Less than 2.1%, Bin 2: 2.1% to 44.4%, Bin 3: 44.4% to 75.1%, Bin 4: 75.1% to 128.7%, Bin 5: More than 128.7%. In specification (7) and (8), the linear and squared term for Fund Growth are used. Fund Size is the realized fund size of a fund in millions of USD. VC Dummy is a dummy variable equal to 1 if the fund is a VC fund and 0 if the fund is a Buyout fund. Capital Inflow is the aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year and in millions of USD. Fund Sequence Firm is the fund sequence number of all funds raised by the firm.

| Variables | (1) Change Net IRR | (2) Change Benchmarked Net IRR | (3) Change Net IRR | (4) Change Benchmarked Net IRR | (5) Change Net IRR | (6) Change Benchmarked Net IRR | (7) Change Net IRR | (8) Change Benchmarked Net IRR |
|---|---|---|---|---|---|---|---|---|
| Fund Growth Bin = 1 | 12.2899*** | 8.9192** | 10.6983*** | 8.4136*** | 8.3569*** | 7.1164** | | |
| | (3.803) | (3.542) | (3.068) | (2.888) | (3.163) | (3.024) | | |
| Fund Growth Bin = 2 | 11.8822*** | 8.3960*** | 9.9063*** | 8.3073*** | 7.7136*** | 7.0837** | | |
| | (3.420) | (3.222) | (2.682) | (2.597) | (2.868) | (2.826) | | |
| Fund Growth Bin = 3 | 10.5629*** | 8.2128*** | 9.6712*** | 8.1346*** | 8.2590*** | 7.3841*** | | |
| | (3.369) | (3.160) | (2.770) | (2.626) | (2.966) | (2.845) | | |
| Fund Growth Bin = 4 | 7.0884** | 6.4543** | 7.2413** | 6.8303** | 6.5220** | 6.2132** | | |
| | (3.379) | (3.111) | (2.955) | (2.806) | (3.103) | (2.987) | | |
| Fund Growth | | | | | | | -0.0401** | -0.0369** |
| | | | | | | | (0.018) | (0.018) |
| Fund Growth ^2 | | | | | | | 0.0000 | 0.0000 |
| | | | | | | | (0.000) | (0.000) |
| Log(Fund Size) | -0.0356 | -0.3733 | -0.2611 | -0.3263 | -0.4239 | -0.4536 | -0.2880 | -0.2867 |
| | (1.094) | (1.039) | (1.098) | (1.056) | (1.114) | (1.090) | (1.114) | (1.085) |
| VC Dummy | -5.3658 | -0.6709 | -20.5276** | -0.0663 | -23.6495** | -1.2103 | -23.6374** | -1.3043 |
| | (3.445) | (3.290) | (9.546) | (9.477) | (9.640) | (9.553) | (9.157) | (8.986) |
| Log(Capital Inflow) | -4.9342*** | -0.5898 | -12.4007*** | -0.4910 | -13.3971*** | -0.8384 | -13.2845*** | -0.7499 |
| | (1.218) | (1.184) | (4.305) | (4.273) | (4.356) | (4.319) | (4.215) | (4.137) |
| Log(Fund Sequence Firm) | 1.8085 | 1.7713 | 2.0166 | 1.9728 | 2.2789 | 2.1619 | 1.8872 | 1.7368 |
| | (1.774) | (1.685) | (1.664) | (1.641) | (1.684) | (1.686) | (1.655) | (1.647) |
| Constant | 44.4202*** | -1.2539 | 135.1666*** | 19.4939 | 136.9677*** | 6.1100 | 145.1448*** | 13.1320 |
| | (14.056) | (13.739) | (39.065) | (38.707) | (39.658) | (39.202) | (38.022) | (37.251) |
| Observations | 588 | 588 | 588 | 588 | 588 | 588 | 588 | 588 |
| R-squared | 0.106 | 0.036 | 0.238 | 0.110 | 0.255 | 0.116 | 0.250 | 0.111 |
| Region Fixed Effects | No | No | No | No | Yes | Yes | Yes | Yes |
| Year Fixed effects | No | No | Yes | Yes | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In Table 7 the predictive margins are showed per fund growth bin, where each specification number in Table 7 corresponds to the specification number in Table 6. The predictive margins of specification (5) show that funds within bin 5 are predicted to have on average a 7.26 percentage point decrease in Net IRR from their previous fund, significant at a 1% level. Although the coefficients for fund growth bin 1 until bin 4 are not significant, it can be observed that the "Change Net IRR" changes from positive to negative for "Fund Growth Bin = 4", which ranges from 75.1% until 128.7%.

**Table 7**

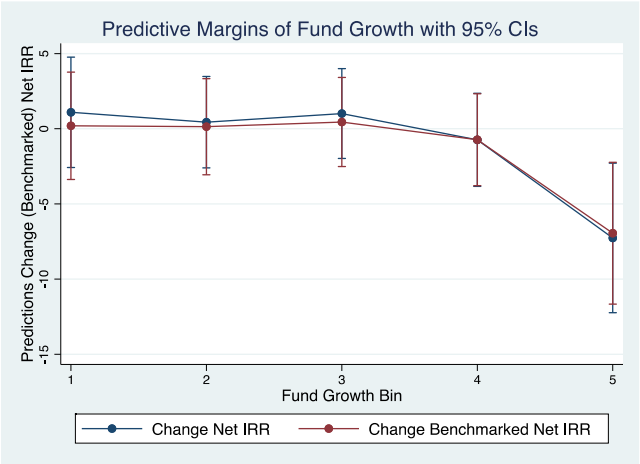
This table displays the predictive margins using the results from the regressions performed in Table 6. Each column number corresponds to the specification number in Table 6. Fund Growth is the growth rate between the realized fund size of a fund and the previous fund size of a fund within the same fund family. Fund growth is divided in the following bins: Bin 1: Less than 2.1%, Bin 2: 2.1% to 44.4%, Bin 3: 44.4% to 75.1%, Bin 4: 75.1% to 128.7%, Bin 5: More than 128.7%.

| Fund Growth Bins | (1) Change Net IRR | (2) Change Benchmarked Net IRR | (3) Change Net IRR | (4) Change Benchmarked Net IRR | (5) Change Net IRR | (6) Change Benchmarked Net IRR |
|---|---|---|---|---|---|---|
| Fund Growth Bin = 1 | 2.8270 | 1.1423 | 2.0999 | 0.6968 | 1.0949 | 0.1788 |
| | (1.834) | (1.702) | (1.884) | (1.804) | (1.874) | (1.820) |
| Fund Growth Bin = 2 | 2.4193 | 0.6190 | 1.3079 | 0.5905 | 0.4516 | 0.1461 |
| | (1.498) | (1.480) | (1.469) | (1.543) | (1.548) | (1.627) |
| Fund Growth Bin = 3 | 1.1000 | 0.4358 | 1.0728 | 0.4178 | 0.9970 | 0.4466 |
| | (1.498) | (1.457) | (1.480) | (1.477) | (1.522) | (1.510) |
| Fund Growth Bin = 4 | -2.3745 | -1.3227 | -1.3571 | -0.8866 | -0.7400 | -0.7243 |
| | (1.525) | (1.392) | (1.571) | (1.527) | (1.580) | (1.558) |
| Fund Growth Bin = 5 | -9.4629*** | -7.7769*** | -8.598*** | -7.7168*** | -7.2620*** | -6.9376*** |
| | (3.104) | (2.884) | (2.423) | (2.264) | (2.533) | (2.404) |
| Observations | 588 | 588 | 588 | 588 | 588 | 588 |
| Region Fixed Effects | No | No | No | No | Yes | Yes |
| Year Fixed Effects | No | No | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

To visualize the relationship between fund growth and performance, the five bins for fund growth from specification (5) and (6) of Table 7 are plotted against the predicted margins for "Change Net IRR" and "Change Benchmarked Net IRR" (Figure 4). It shows that funds in bin 1 until bin 3 still have a positive predicted change in performance. However, at the 4$^{th}$ bin the predicted change in performance becomes negative, which suggests that if funds grow with more than 75.1%, it leads to a decrease in performance. As can be seen at the confidence intervals in the figure, only the 5$^{th}$ bin is significantly different from zero. The findings of Table 6 and 7 suggest that fund growth has a linear relationship with performance and that specifically large positive fund growth has a negative effect on performance, which provides evidence against the first hypothesis where a non-linear relationship was expected between fund growth and performance.

**Figure 4:** In this figure the fund growth bins are plotted against the predicted Change Net IRR (see specification (5) in Table 7) and predicted Change Benchmarked Net IRR (see specification (6) in Table 7). Also, the 95% confidence interval is showed for each predicted margin. The fund growth bins are divided as follows: Bin 1: Less than 2.1%, Bin 2: 2.1% to 44.4%, Bin 3: 44.4% to 75.1%, Bin 4: 75.1% to 128.7 %, Bin 5: more than 128.7%.




## 6.2 The effect of expected versus unexpected fund growth on fund performance

### 6.2.1 Main tables

To assess the effect of expected versus unexpected fund growth on fund performance, multiple OLS regressions are performed which can be found in Table 8. The main variables of interest are "Expected Fund Growth" and "Unexpected Fund Growth", which are both divided into five different bins in specification (1) until (6). Adding region and year fixed effects considerably increases the R-squared, however the 2$^{nd}$ and 3$^{rd}$ bin for expected growth and the 2$^{nd}$ bin of unexpected growth become insignificant in both specification (5) and (6) after the fixed effects are added. In specification (5) all bins for expected growth are insignificant, indicating that none of the first four bins is performing significantly different from the 5$^{th}$ bin. For unexpected growth the 1$^{st}$, 3$^{rd}$ and 4$^{th}$ bin are positive and significant at a level of 5%. The 1$^{st}$ bin of unexpected growth has a 6.2% higher positive change in Net IRR than a fund that falls within "Fund Unexpected Growth Bin = 5". In specification (7) and (8) of Table 8, both expected and unexpected growth are included in the regression as a linear and a squared term. Although the linear and the squared term are insignificant for expected growth, they are negative and significant for unexpected growth. This suggests a concave relationship between unexpected fund growth and performance. So, these results provide evidence that unexpected growth larger than 26.5% leads to lower performance.

**Table 8**

This table displays the results of OLS regressions. The dependent variables are Change Net IRR and Change Benchmarked Net IRR. Change Net IRR and Change Benchmarked Net IRR is the percentage point difference in the Net IRR or Benchmarked Net IRR between two subsequent funds. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth in specifications (1) – (6) are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth in specifications (1) - (6) are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%. In specification (7) and (8), the linear and squared term for Fund Growth are used. Fund Size is the realized fund size of a fund in millions of US dollars. VC Dummy is a dummy variable equal to 1 if the fund is a VC fund and 0 if the fund is a Buyout fund. Capital Inflow is the aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year and in millions of US dollars. Fund Sequence Firm is the fund sequence number of all funds raised by the firm.

| Variables | (1) Change Net IRR | (2) Change Benchmarked Net IRR | (3) Change Net IRR | (4) Change Benchmarked Net IRR | (5) Change Net IRR | (6) Change Benchmarked Net IRR | (7) Change Net IRR | (8) Change Benchmarked Net IRR |
|---|---|---|---|---|---|---|---|---|
| Fund Expected Growth Bin = 1 | 3.0164 | 1.6096 | 2.0130 | 0.8530 | -0.7457 | -0.6875 | | |
| | (4.193) | (3.966) | (4.511) | (4.230) | (4.923) | (4.697) | | |
| Fund Expected Growth Bin = 2 | 6.3757** | 5.4380* | 5.8443** | 5.2561** | 3.1811 | 3.8345 | | |
| | (2.989) | (2.916) | (2.674) | (2.675) | (3.078) | (3.076) | | |
| Fund Expected Growth Bin = 3 | 4.8058* | 2.3817 | 2.9704 | 1.6006 | 0.8955 | 0.4992 | | |
| | (2.840) | (2.692) | (2.447) | (2.338) | (2.619) | (2.555) | | |
| Fund Expected Growth Bin = 4 | 0.2869 | -0.2985 | -0.7214 | -0.7194 | -1.5333 | -1.2899 | | |
| | (2.975) | (2.766) | (2.549) | (2.447) | (2.592) | (2.533) | | |
| Fund Unexpected Growth Bin = 1 | 10.2036*** | 7.1408** | 6.8606** | 5.8683** | 6.2444** | 5.4043* | | |
| | (3.232) | (3.029) | (3.025) | (2.912) | (3.082) | (2.975) | | |
| Fund Unexpected Growth Bin = 2 | 6.1757* | 4.2075 | 4.1880 | 4.0291 | 4.4215 | 4.1069 | | |
| | (3.262) | (2.948) | (2.847) | (2.696) | (2.884) | (2.773) | | |
| Fund Unexpected Growth Bin = 3 | 6.9923** | 6.3940** | 6.8156** | 5.6430** | 6.2271** | 5.1741* | | |
| | (2.982) | (2.796) | (2.826) | (2.791) | (2.794) | (2.802) | | |
| Fund Unexpected Growth Bin = 4 | 5.5673** | 5.4589** | 5.3225** | 5.2638** | 5.3363** | 5.2259** | | |
| | (2.548) | (2.396) | (2.240) | (2.151) | (2.316) | (2.243) | | |
| Expected Growth | | | | | | | -0.0237 | -0.0229 |
| | | | | | | | (0.029) | (0.028) |
| Expected Growth ^2 | | | | | | | 0.0001 | 0.0001 |
| | | | | | | | (0.000) | (0.000) |
| Unexpected Growth | | | | | | | -0.0727*** | -0.0579** |
| | | | | | | | (0.025) | (0.024) |
| Unexpected Growth ^2 | | | | | | | -0.0003* | -0.0003* |
| | | | | | | | (0.000) | (0.000) |
| Log(Fund Size) | 0.0068 | -0.4988 | -0.5097 | -0.5328 | -0.5432 | -0.6058 | 0.0913 | -0.1153 |
| | (1.144) | (1.081) | (1.189) | (1.132) | (1.201) | (1.163) | (1.234) | (1.199) |
| VC Dummy | -6.3388* | -1.7563 | -22.5342** | -1.9067 | -25.4627*** | -3.0152 | -24.0525*** | -2.0548 |
| | (3.531) | (3.319) | (9.228) | (9.122) | (9.370) | (9.225) | (8.603) | (8.434) |
| Log(Capital Inflow) | -5.4672*** | -0.9453 | -13.2496*** | -1.2185 | -14.1267*** | -1.5093 | -13.3605*** | -0.9143 |
| | (1.468) | (1.409) | (4.293) | (4.227) | (4.376) | (4.300) | (3.967) | (3.892) |
| Log(Fund Sequence Firm) | 2.3573 | 2.0607 | 2.3900 | 2.1709 | 2.5368 | 2.2936 | 2.1409 | 1.9969 |
| | (1.770) | (1.693) | (1.665) | (1.644) | (1.681) | (1.681) | (1.626) | (1.635) |
| Constant | 50.1273*** | 3.9358 | 145.6759*** | 29.0753 | 147.0133*** | 15.9901 | 142.7737*** | 12.7192 |
| | (15.220) | (14.780) | (38.939) | (38.311) | (39.737) | (39.011) | (35.584) | (34.880) |
| Observations | 588 | 588 | 588 | 588 | 588 | 588 | 588 | 588 |
| R-squared | 0.101 | 0.038 | 0.235 | 0.111 | 0.257 | 0.120 | 0.283 | 0.141 |
| Region Fixed Effects | No | No | No | No | Yes | Yes | Yes | Yes |
| Year fixed effects | No | No | Yes | Yes | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

**Table 9**

This table displays the predictive margins using the results from the regressions performed in Table 8. Each column number corresponds to the specification number in Table 8. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%.

| Fund Growth Bins | (1) Change Net IRR | (2) Change Benchmarked Net IRR | (3) Change Net IRR | (4) Change Benchmarked Net IRR | (5) Change Net IRR | (6) Change Benchmarked Net IRR |
|---|---|---|---|---|---|---|
| Fund Expected Growth Bin = 1 | -0.9451 | -1.5812 | -1.0852 | -1.9184 | -2.1930 | -2.5389 |
| | (3.011) | (2.807) | (3.416) | (3.175) | (3.568) | (3.374) |
| Fund Expected Growth Bin = 2 | 2.4090 | 2.2462 | 2.7489* | 2.4906 | 1.7411 | 1.9914 |
| | (1.544) | (1.5019) | (1.522) | (1.586) | (1.689) | (1.719) |
| Fund Expected Growth Bin = 3 | 0.8362 | -0.8102 | -0.1251 | -1.1622 | -0.5410 | -1.3384 |
| | (1.547) | (1.421) | (1.441) | (1.375) | (1.401) | (1.371) |
| Fund Expected Growth Bin = 4 | -3.6788** | -3.4872** | -3.8134** | -3.4793** | -2.9632* | -3.1212* |
| | (1.860) | (1.624) | (1.679) | (1.545) | (2.236) | (1.601) |
| Fund Expected Growth Bin = 5 | -3.9596 | -3.1840 | -3.0868 | -2.7562 | -1.4232 | -1.8259 |
| | (2.450) | (2.360) | (2.062) | (2.016) | (2.236) | (2.209) |
| Fund Unexpected Growth Bin = 1 | 4.2247** | 1.7493 | 1.8018 | 0.8381 | 1.3023 | 0.4944 |
| | (2.059) | (1.957) | (2.180) | (2.142) | (2.216) | (2.170) |
| Fund Unexpected Growth Bin = 2 | 0.1496 | -1.2229 | -0.9085 | -1.0342 | -0.5581 | -0.8364 |
| | (2.111) | (1.814) | (1.945) | (1.807) | (1.917) | (1.806) |
| Fund Unexpected Growth Bin = 3 | 0.9890 | 0.9814 | 1.7392 | 0.5943 | 1.2633 | 0.2428 |
| | (1.986) | (1.914) | (2.081) | (2.095) | (2.111) | (2.131) |
| Fund Unexpected Growth Bin = 4 | -0.4470 | 0.0402 | 0.2325 | 0.2083 | 0.3655 | 0.2921 |
| | (1.279) | (1.287) | (1.266) | (1.292) | (1.302) | (1.308) |
| Fund Unexpected Growth Bin = 5 | -6.0175*** | -5.4211*** | -5.0948*** | -5.0591*** | -4.9750** | -4.9367*** |
| | (2.274) | (2.101) | (1.942) | (1.838) | (1.962) | (1.891) |
| Observations | 588 | 588 | 588 | 588 | 588 | 588 |
| Region Fixed Effects | No | No | No | No | Yes | Yes |
| Year Fixed Effects | No | No | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

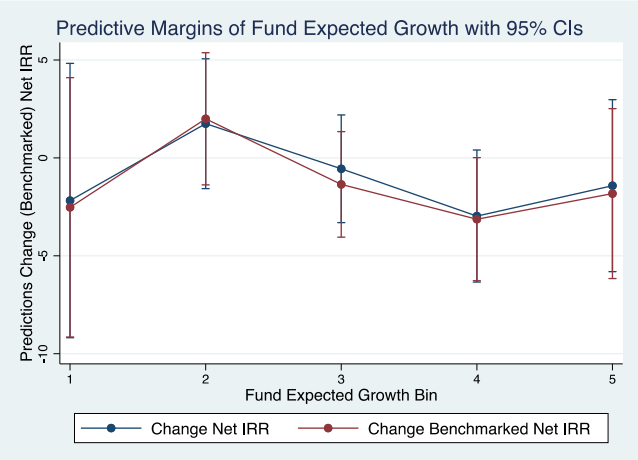
*** p<0.01, ** p<0.05, * p<0.1

In Table 9 the predictive margins are showed per expected and unexpected fund growth bin, where each specification number in Table 9 corresponds to the regression that is performed in Table 8. In specification (6) it can be seen that funds with expected growth that falls within "Fund Expected Growth Bin = 4" are predicted to have a 3.12 percentage point lower Benchmarked Net IRR compared to their previous fund, significant at a 10% level. So, high expected growth (between 66.6% and 112.8%) negatively affects performance. Although the sign on the 5$^{th}$ bin of expected growth is also negative, it is not statistically significant. For unexpected growth the 5$^{th}$ bin is negative and statistically significant in all specifications. In specification (6) it can be seen that funds that experience unexpected growth that falls within bin 5 are predicted to have on average a 4.94 percentage point lower Benchmarked Net IRR

compared to their previous fund, significant at a 1% level. This indicates that funds with large unexpected growth (more than 26.5%) experience a decrease in performance compared to their previous fund.

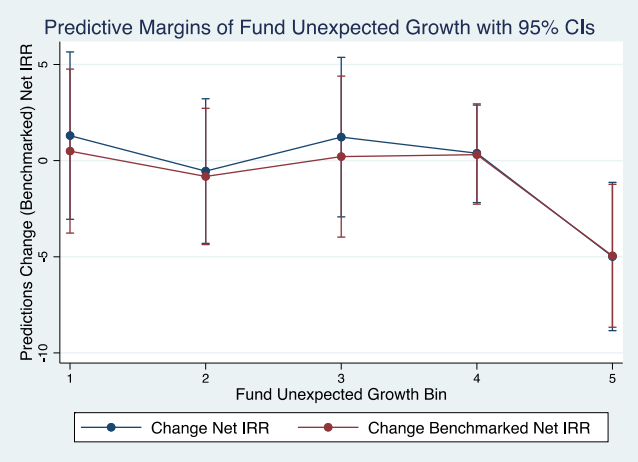
To visualize the relationship between fund expected growth and performance, the five bins for fund expected growth from specification (5) and (6) of Table 9 are plotted against the predicted margins for "Change Net IRR" and "Change Benchmarked Net IRR" in Figure 5. This figure suggests that fund expected growth has a cubic relationship with Change (Benchmarked) Net IRR.

**Figure 5:** In this figure the fund expected growth bins are plotted against the predicted Change Net IRR (see specification (5) in Table 9) and predicted Change Benchmarked Net IRR (see specification (6) in Table 9). Also, the 95% confidence interval is showed for each predicted margin. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%.




In Figure 6 the five bins for unexpected growth from specification (5) and (6) of Table 9 are plotted against the predicted margins for "Change Net IRR" and "Change Benchmarked Net IRR". This figure suggests that fund unexpected growth has a concave relationship with the change in performance, which is in line with the findings of specification (7) and (8) of Table 8, where both the linear and squared term of unexpected growth are negative and significant. The figure also clearly illustrates that funds with an unexpected growth that falls within bin 5 have a significantly lower performance compared to their previous fund.

**Figure 6:** In this figure the fund unexpected growth bins are plotted against the predicted Change Net IRR (see specification (5) in Table 9) and predicted Change Benchmarked Net IRR (see specification (6) in Table 9). Also, the 95% confidence interval is showed for each predicted margin. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%.




The results for the expected growth bins are providing evidence against the second hypothesis, where a positive relationship was presumed between expected growth and fund performance up to a certain point after which the relation was presumed to be negative. Although the relationship is negative and significant for expected growth bin 4 (which indicates that high expected growth has a negative effect on performance), the other bins for expected growth are not significantly different from zero. The results for unexpected growth indicate that large positive unexpected growth has a negative effect on performance, which is in line with the third hypothesis where was presumed that large unexpected growth has a negative effect on the change in fund performance. However, large negative unexpected growth (so a lower fund growth than was expected) does not seem to have a negative effect on performance, which provides evidence against the third hypothesis. Therefore, the results for unexpected growth only confirm a part of the third hypothesis.

### 6.2.2 Expected versus unexpected growth for subgroups of the sample

In this section the effect of expected versus unexpected fund growth on fund performance is assessed for multiple subgroups of the sample. The sample is divided in subgroups based on the fund size of the previous fund, whether the fund is a VC or a Buyout fund, and lastly based on the region focus of the fund. Table 10 (*Appendix 5*) displays the number of funds in each expected and unexpected growth bin per subgroup of the sample. The table shows that some

subgroups (such as Region Focus Non-US & EU) contain a relatively low number of fund observations. This should be taken into consideration while interpreting the results.

#### 6.2.2.1 Subgroups based on the previous fund's fund size

Table 11 (*Appendix 6*) displays the results of multiple OLS regressions, where the sample is divided into the following subgroups: Small funds (<$152mln), midsized funds (<$152mln-$332mln), large funds ($332mln-$775mln) and mega funds (>$775mln). Table 12 (*Appendix 7*) shows the predictive margins using the results from the regressions performed in Table 11 (*Appendix 6*). Overall these results suggest that large expected and unexpected growth has specifically a negative effect on performance for mega funds, as both the 5$^{th}$ bin of expected growth as well as the 5$^{th}$ bin of unexpected growth are negative and statistically significant. In specification (8) it can be seen that mega funds with expected growth in bin 2 have a positive change in the Benchmarked Net IRR, significant at a 5% level. This implies that for mega funds it is better to let their funds grow by a smaller amount. Surprisingly, as can been seen in specification (5) and (6), for large funds a small percentage of unexpected growth (between 1% and 26.5%) actually leads to higher performance since the 4$^{th}$ bin is positive and significant at a 5% level. Looking at specification (5), a large fund with unexpected growth in bin 4 has on average an increase in Net IRR of 3.7 percentage points compared to its previous fund.

#### 6.2.2.2 Subgroups based on VC versus Buyout funds

Table 13 (*Appendix 8*) displays the results of multiple OLS regressions, where the sample is divided into one subgroup for VC funds and one subgroup for Buyout funds. Table 14 (*Appendix 9*) shows the predictive margins using the results from the regressions performed in Table 13. It is remarkable that almost all of the bins for expected and unexpected growth are not significant when "Change Benchmark Net IRR" is used as the dependent variable, for both the subgroup for VC funds as well as for Buyout funds.

In specification (1) of Table 14 (*Appendix 9*) it can be seen that Buyout funds with expected growth over 36% experience a decrease in their subsequent Net IRR, as the 3$^{rd}$, 4$^{th}$ and 5$^{th}$ bin are all negative and statistically significant. Also, it can be seen that the negative effect on performance becomes stronger with larger expected growth. These results indicate that it is better for Buyout funds to set their target fund size not much higher than their previous fund size, to avoid a subsequent decrease in performance. For unexpected growth the coefficient for the 5$^{th}$ bin is negative and significant, suggesting that large unexpected growth negatively influences subsequent fund performance for Buyout funds.

In specification (3) of Table 14 (*Appendix 9*) the results are displayed for VC funds. It can be seen that expected growth between 7% and 66.6% significantly increases the subsequent VC fund's Net IRR. So, in contrast to Buyout funds it is beneficial for VC funds to increase their target fund size from their previous fund size. Also, it can be seen that both the 3rd and the 4th bin of unexpected growth are positive and significant in specification (3), indicating that a certain degree of unexpected growth (up to 26.5%) leads to a positive change in the Net IRR for VC funds. In contrast to Buyout funds, large unexpected growth does not significantly impact the Net IRR for VC funds.

#### 6.2.2.3 Subgroups based on a fund's region focus

Table 15 (*Appendix 10*) displays the results of multiple OLS regressions, where the sample is divided into the following subgroups: US funds, EU funds and Non-US and EU funds. Table 16 (*Appendix 11*) shows the predictive margins using the results from the regressions performed in Table 15 (*Appendix 10*). Specification (1) of Table 16 (*Appendix 11*) shows that for US focused funds expected growth between 7% and 36% has a positive effect on performance as the 2nd bin of expected growth is positive and statistically significant. However, the 4th bin of expected growth is negative and significant, which indicates that if the expected growth becomes large it negatively affects the Net IRR.

Specification (3) of Table 16 (*Appendix 11*) displays that for EU focused funds both the 3rd and 4th bin of expected growth are negative and significant. Surprisingly, the 3rd bin for unexpected growth (between -1% and 1%) is also negative and significant, which indicates that EU focused funds with very little or even no unexpected growth would also experience a decrease in performance. However, as shown in specification (8) of Table 10 (*Appendix 5*), the 3rd bin of unexpected growth for EU focused funds only contains nine fund observations and therefore this finding might not be representative for a larger sample. Lastly, the 5th bin for unexpected growth in specification (3) is negative and significant at a 1% level. This means that an EU focused fund with unexpected growth larger than 26.5% has a predicted decrease in the Net IRR of 15.9 percentage points.

Specification (5) shows that the 5th bin of expected growth (expected growth larger than 112.8%) significantly decreases the Net IRR for Non-US and EU focused funds. However, the rest of the variables within this specification are not significant. When "Change Benchmarked Net IRR" is used as a performance measure instead of the "Change Net IRR" in specification (6), the 1st expected growth bin is positive and significant, indicating that expected growth lower than 7% increases the Benchmarked Net IRR. Furthermore, it can be seen that the 4th

unexpected growth bin is negative and significant, which indicates that unexpected growth between 1% and 26% leads to a decrease in the Benchmarked Net IRR.

It is difficult to compare the results between the subgroups with a different region focus, as almost none of the coefficients are significant in more than one subgroup. However, the 4th expected growth bin is significant for both US and EU focused funds. As can be seen the coefficient is more negative for EU focused funds, which indicates that EU focused funds with an expected growth between 66.6% and 112.8% experience a larger decrease in performance than US focused funds that have the same level of expected growth. Also, as the subgroup of Non-US and EU focused groups is very small, these results might not be representative for a larger sample.

# 7 Robustness checks

In this chapter three different robustness checks are performed to check whether the results are not driven by the choice of performance measure, by inconclusive performance results or by any large outliers in the performance measures. The robustness checks will only be performed for the regressions from the main part of the paper where all control variables and fixed effects are included.

## 7.1 Multiple as performance measure

In the following robustness check the variable "Change Multiple" is used as dependent variable instead of the "Change (Benchmarked) Net IRR" that is used as dependent variable in the baseline regressions, to check if results are not driven by the choice of the performance measure.

### 7.1.1 Hypothesis 1 - Multiple as performance measure

In Table 17 (*Appendix 12*) the same OLS regressions are performed as in Table 6, however in these regressions the dependent variable is "Change Multiple" instead of "Change (Benchmarked) Net IRR". All four fund growth bins remain positive and significant, indicating that they perform significantly better than the 5th fund growth bin. Table 18 (*Appendix 12*) displays the predictive margins using the results from the regressions performed in Table 17 (*Appendix 12*). When comparing these results with the baseline results in Table 7, it can be seen that the 5th fund growth bin remains negative and statistically significant in all specifications. Furthermore, the 4th fund growth bin that was not significant in the baseline

results, becomes statistically significant at a 1% level. As both the 4th and the 5th bin are negative and statistically significant, this confirms the previous findings that large positive fund growth leads to lower performance. Also, it is shown that the negative effect on performance becomes stronger with larger fund growth, as the point estimates on the 5th fund growth bin are more negative than the point estimates on the 4th fund growth bin.

### 7.1.2 Hypothesis 2 & 3 - Multiple as performance measure

In Table 19 (*Appendix 13*) the same OLS regressions are performed as in Table 8, where the dependent variable "Change (Benchmarked) Net IRR" is replaced by "Change Multiple". Table 20 (*Appendix 14*) displays the predictive margins using the results from the regressions performed in Table 19 (*Appendix 13*). The 3rd, 4th, and 5th bin of expected growth are all negative and significant, indicating that expected growth larger than 36% leads to lower performance. This result is more pronounced than the result in the baseline regression, where only the 4th bin of expected growth is negative and statistically significant. For unexpected growth both the 4th and the 5th bin are negative and significant, indicating that positive unexpected growth (>1%) has a negative effect on performance. This result is also more pronounced than in the baseline results, where is found that only unexpected fund growth larger than 26.5% negatively affects subsequent fund performance. Lastly, it can be observed that the negative effect on performance becomes larger if the expected and unexpected growth becomes higher, as the point estimates become more negative the higher the bin number gets.

## 7.2 Extending the investment period criterium from 5 to 8 years

In the following robustness check only funds are included in the regressions that have invested for 8 years (instead of the 5-year investment criterion that is used for the main sample). This is done to check if the results are not biased by funds that might still be investing and therefore do not provide the ultimate fund's performance.

### 7.2.1 Hypothesis 1 - Extended investment period criterium

In Table 21 (*Appendix 15*) the same OLS regressions are performed as in Table 6, however in this sample only funds are used that have an investment period of at least 8 years (instead of the 5-year criterion that is used in the main sample). Changing the investment criterion does not change the significance of the results, the points estimates only become higher compared to the point estimates in Table 6. Table 22 (*Appendix 16*) displays the predictive margins using

the results from the regressions performed in Table 21 (*Appendix 15*). In specification (1), when "Change Net IRR" is used as dependent variable, the 5th fund growth bin remains statistically significant and the point estimate for the coefficient becomes more negative than in the baseline regression. Where in the main sample a fund with fund growth in the 5th bin has a 7.6 percentage point decrease in the Net IRR, it is found to have a decrease in Net IRR of 10.7 percentage points when only funds with an investment period of at least 8 years are used. In specification (2), when "Change Benchmarked Net IRR" is used as dependent variable, the sign for the coefficient on the 5th fund growth bin remains negative, although no significant effect on performance is found anymore.

### 7.2.2 Hypothesis 2 & 3 - Extended investment period criterium

Table 23 (*Appendix 17*) shows the same OLS regressions as performed in Table 8, but now only funds that have at least an investment period of 8 years are included in the sample. Table 24 (*Appendix 18*) displays the predictive margins using the results from the regressions performed in Table 23 (*Appendix 17*). In specification (1) both the 4th and 5th bin of expected growth are statistically significant, while in the baseline results (Table 9) the 5th bin was not significant. Also, the 4th bin of expected growth has a more pronounced negative effect on performance than in the baseline results. These results suggest that large expected growth has a more negative effect on performance than was found in the baseline regressions. In specification (2), where "Change Benchmarked Net IRR" is used as dependent variable, the 4th bin of expected growth is not statistically significant anymore although the sign remains negative. In both specification (1) and (2) the 2nd bin of unexpected growth is negative and becomes statistically significant, which suggests that not only large positive unexpected growth is bad for performance, but also modest negative unexpected growth (unexpected growth between -25% and -1%) decreases performance. The 5th bin of unexpected growth remains statistically significant for both specification (1) and (2), although the point estimates are more negative than in the baseline results. This indicates that large unexpected growth has an even stronger negative effect on performance than was found in the baseline results. In the third hypothesis it was expected that only large unexpected growth (both positive and negative) would negatively affect performance, however these findings provide evidence that also modest negative unexpected growth decreases performance.

### 7.3 Winsorizing the performance measures at 1% and 5%

In the following robustness check the performance measures are winsorized at 1% and 5% to check whether the results are not driven by any large outliers.

#### 7.3.1 Hypothesis 1 – Winsorizing the performance measures

In Table 25 (*Appendix 19*) the same OLS regressions are performed as in Table 6, but now the dependent variables are winsorized at 1% and 5%. Overall, the results are providing the same results as the results from the baseline regressions, although the point estimates for the coefficients are somewhat lower than in the baseline regressions. Table 26 (*Appendix 20*) displays the predictive margins using the results from the regressions performed in Table 21 (*Appendix 15*). Although the point estimates are less pronounced than in the baseline regressions, the results are fairly similar to the results in the baseline regression and therefore confirming previous findings.

#### 7.3.2 Hypothesis 2 & 3 – Winsorizing the performance measures

Table 27 (*Appendix 21*) shows the same OLS regressions as performed in Table 8, but now the dependent variables are winsorized at 1% and 5%. Table 28 (*Appendix 22*) displays the predictive margins using the results from the regressions performed in Table 23 (*Appendix 17*). In specification (2), (3) and (4) the $5^{th}$ bin of expected growth is negative and becomes statically significant. Furthermore, the $5^{th}$ bin for unexpected growth becomes insignificant when the performance measures are winsorized at 5%, although the sign remains negative. Despite some changes in the significance of the coefficients, the results are fairly similar to the baseline results, thus confirming previous findings.

## 8 Conclusion

The research within this paper is motivated by the fact that, due to the large increase of investments into the private equity industry, many PE firms experience large growth of their funds. Although prior literature has focused on the relationship between fund size and performance in the cross-section, limited research has been done into the effect of fund growth on performance for a specific PE firm. This study contributes to the existing literature for the first time about the determinants of PE fund performance by analysing the effect of fund growth on performance and by differentiating between expected and unexpected growth.

A dataset from Preqin is used which is manually extended with fund sequence and family numbers. Then, by using the information about a fund's target size, expected and unexpected fund growth are differentiated. A sample of 588 funds with vintage years ranging from 1988 until 2011, raised by 393 different PE firms, has been analysed to examine the effect of expected and unexpected growth on fund performance. The findings provide some new and interesting knowledge into the subject of fund growth.

First, in line with the findings of Kaplan and Schoar (2005) and Robinson and Sensoy (2011), it is found that fund growth for a particular PE firm negatively affects fund performance. When fund growth is divided into five different bins it is found that specifically large fund growth leads to lower performance. This finding appears to be robust to the choice of performance measure, when a stricter criterion for the investment period of funds is used or when the performance measure is winsorized.

After differentiating between expected and unexpected fund growth and dividing them in five different growth bins, evidence is found that large expected growth leads to lower performance. In the robustness checks the results are even more pronounced, as not only the $4^{th}$ bin but also the $5^{th}$ bin of expected growth is negative and statistically significant in the robustness checks. Dividing the sample in subgroups shows that large expected growth has specifically a negative effect on performance for mega funds (>$775mln) and Buyout funds. For VC funds, expected growth (up to 66.6%) has a significant positive effect on performance.

Lastly, unexpected growth has a statistically significant negative effect on fund performance. As the squared term for unexpected growth is also negative and statistically significant, this provides evidence that when the unexpected growth gets very large the negative relationship between fund growth and performance becomes even stronger. This result is also found when the unexpected growth is divided into five different bins, as the bin with the largest unexpected growth significantly decreases performance. When the sample is divided into subgroups, specifically mega funds, Buyout funds and EU focused funds appear to have a strong negative relation between large unexpected growth and performance. On the other hand, for VC funds a certain degree of unexpected growth (up to 26.5%) is found to be beneficial for performance. The finding that large unexpected growth negatively affects performance is robust in all robustness checks except for the robustness check where the performance measures are winsorized at 5%. Against expectations, in the main results no statistically significant negative relation is found between negative unexpected growth (a lower fund growth than expected) and performance. However, in the robustness check where a stricter

criterion for the investment period of funds is used, evidence is found that also modest negative unexpected growth (unexpected growth between -25% and -1%) decreases performance.

The findings have important implications for both the general partners as well as the limited partners. As the results provide evidence that large expected growth is bad for fund performance, general partners could anticipate on this by setting their target fund size not much higher than their previous fund size to avoid a subsequent decrease in fund performance. Furthermore, as this study finds that large unexpected growth also has a significant negative effect on fund performance, general partners could prevent the fund from a large positive unexpected growth by implementing a hardcap. For limited partners these results suggest that investing in funds that do not expect to grow by a substantial amount and that maintain a hardcap would provide them with higher returns.

## 9 Limitations and suggestions for future research

This paper provides a contribution to the existing research, as it differentiates the amount of expected versus unexpected growth and examines its impact on fund performance. However, there are some limitations that need to be considered. Firstly, the results of this paper might be subject to omitted variable bias. Due to the private nature of the PE industry, it is hard to obtain detailed information for all relevant variables that should be included in the regressions. For example, in this paper the industry of a PE fund could not be used as a control variable, as the Preqin database did not provide useful data for this variable.

Another limitation is the limited amount of observations that could be used in this paper. The final sample contains 588 funds raised by 393 PE firms. However, when this sample is divided in subgroups, some subgroups are relatively small which makes it hard to draw substantial conclusions. It would therefore be recommended to extend the sample size to be able to further analyse the relation between expected and unexpected growth amongst different subgroups.

Furthermore, the data from Preqin could be biased, as funds often report voluntary and therefore could be induced to report more positive returns. When Harris, Jenkinson & Kaplan (2014) compare data sets obtained from different databases they find results that are similar in both a quantitative and qualitative way. However, it is nonetheless recommended to take a potential sample bias into account while analysing the results.

Another potential cause of bias in the sample is provided by Kaplan and Schoar (2005) and Hochberg, Ljungqvist, and Vissing-Jørgensen (2014). They argue that top performing

funds stay small on a voluntary basis. However, if this would be true this generates a problem of reversed causality as it means that funds grow at a slower pace because they have good performance, rather than the other way around.

In this paper a number of additional questions emerged which could not be analysed due to the lack of available data. First, it would be interesting to examine how funds grow. Do funds increase the number of acquisitions or do they increase the size of their deals? And, does a different way of growing differently affects fund performance? It would also be interesting to complement the sample with data on the number of employees to analyse if limited attention is a potential explanation for the negative relationship between fund performance and large expected/unexpected growth. Lastly, it would be interesting to analyse if funds with large expected/unexpected growth start investing in companies that are active within different industries than the companies in their previous funds. Maybe the negative effect of large expected/unexpected growth could be caused by the fact that companies start to invest in industries in which they are inexperienced. The above-mentioned questions are only a small selection of the high number of questions that are still unanswered within the PE industry. For this reason, the PE industry remains an interesting field for future research.

**Bibliography**


Bargeron, L. L., Schlingemann, F. P., Stulz, R. M., & Zutter, C. J. (2008). Why do private acquirers pay so little compared to public acquirers?. *Journal of Financial Economics*, *89*(3), 375-390.

Berk, J. B., & DeMarzo, P.M. (2011). *Corporate Finance* (2nd ed.) Boston. MA: Prentice Hall.

Brown, G. W., Harris, R. S., Jenkinson, T., Kaplan, S. N., & Robinson, D. T. (2015). What do different commercial data sets tell us about private equity performance?. *Available at SSRN 2706556*.

Cumming, D., & Dai, N. (2010). Local bias in venture capital investments. *Journal of Empirical Finance*, *17*(3), 362-380.

Cumming, D., & Dai, N. (2011). Fund size, limited attention and valuation of venture capital backed firms. *Journal of Empirical Finance*, *18*(1), 2-15.

Cumming, D., Fleming, G., & Schwienbacher, A. (2009). Style drift in private equity. *Journal of Business Finance & Accounting*, *36*(5-6), 645-678.

DeAngelo, H., DeAngelo, L., & Rice, E. M. (1984). Going private: Minority freezeouts and stockholder wealth. *The Journal of Law and Economics*, *27*(2), 367-401.

Degeorge, F., Martin, J., & Phalippou, L. (2016). On secondary buyouts. *Journal of Financial Economics*, *120*(1), 124-145.

Diller, C., & Kaserer, C. (2009). What drives private equity returns?–Fund inflows, skilled GPs, and/or risk?. *European Financial Management*, *15*(3), 643-675.

Gompers, P., & Lerner, J. (2000). Money chasing deals? The impact of fund inflows on private equity valuation. *Journal of financial economics*, *55*(2), 281-325.

Harris, R. S., Jenkinson, T., & Kaplan, S. N. (2014). Private equity performance: What do we know?. *The Journal of Finance*, *69*(5), 1851-1882.

Hege, U., Palomino, F., & Schwienbacher, A. (2009). Venture capital performance: the disparity between Europe and the United States. *Finance*, *30*(1), 7-50.

Higson, C., & Stucke, R. (2012). The performance of private equity. *Available at SSRN 2009067*.

Hochberg, Y. V., Ljungqvist, A., & Lu, Y. (2007). Whom you know matters: Venture capital networks and investment performance. *The Journal of Finance*, *62*(1), 251-301.

Hochberg, Y. V., Ljungqvist, A., & Vissing-Jørgensen, A. (2014). Informational holdup and performance persistence in venture capital. *The Review of Financial Studies*, *27*(1), 102-152.

Humphery-Jenner, M. (2012). Private equity fund size, investment size, and value creation. *Review of Finance*, *16*(3), 799-835.

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American economic review*, *76*(2), 323-329.

Kaplan, S. N., & Lerner, J. (2010). It ain't broke: The past, present, and future of venture capital. *Journal of Applied Corporate Finance*, *22*(2), 36-47.

Kaplan, S. N., & Schoar, A. (2005). Private equity performance: Returns, persistence, and capital flows. *The journal of finance*, *60*(4), 1791-1823.

Kaplan, S. N., & Strömberg, P. (2009). Leveraged buyouts and private equity. *Journal of economic perspectives*, *23*(1), 121-46.

Ljungqvist, A., & Richardson, M. (2003). *The cash flow, return and risk characteristics of private equity* (No. w9454). National Bureau of Economic Research.

Lopez-de-Silanes, F., Phalippou, L., & Gottschalg, O. (2015). Giants at the gate: Investment returns and diseconomies of scale in private equity. *Journal of Financial and Quantitative Analysis*, *50*(3), 377-411.

McCourt, M. (2018). Estimating skill in private equity performance using market data. In *Paris December 2016 Finance Meeting EUROFIDAI-AFFI*.

McKinsey & Company. (2020). A new decade for private markets. *Global Private Markets Review 2020.* Retrieved from https://www.mckinsey.com/~/media/mckinsey/industries/private%20equity%20and%20principal%20investors/our%20insights/mckinseys%20private%20markets%20annual%20review/mckinsey-global-private-markets-review-2020-v4.ashx

Metrick, A., & Yasuda, A. (2010). The economics of private equity funds. *The Review of Financial Studies*, *23*(6), 2303-2341.

Phalippou, L., & Gottschalg, O. (2009). The performance of private equity funds. *The Review of Financial Studies*, *22*(4), 1747-1776.

Phalippou, L., & Zollo, M. (2005). *What drives private equity fund performance?*. Financial Institutions Center, Wharton School, University of Pennsylvania.

Robinson, D. T., & Sensoy, B. A. (2011). Private equity in the 21st century: Liquidity, cash flows, and performance from 1984-2010. *NBER Working paper*, *17428*.

## Appendix 1

### 9.1 Variables defintions

This section provides more information about the various dependent and independent variables that are used in this paper. In Table 4 (*Appendix 3*) a brief description of the variables can be found.

#### 9.1.1 Dependent variables

As explained in the literature review, previous research has used different measures of performance. In this paper the following performance measures are used.

Change Net IRR

The Net IRR is the internal rate of return of a fund that is earned by a limited partner after any fees and carry. The change in Net IRR is calculated by subtracting the Net IRR from the previous fund from the Net IRR of the subsequent fund. It therefore measures the percentage point increase or decrease in the Net IRR. This measure makes it possible to look at the effect of fund growth on performance per PE firm instead of looking at the effect of fund growth within the cross section of PE funds.

Change Benchmarked Net IRR

The Benchmarked Net IRR is the internal rate of return benchmarked against the appropriate benchmark. Preqin chooses the benchmark based on, for example, the geographic focus of the fund, the vintage year and the industry of the fund. It is calculated as the Net IRR minus the IRR of the corresponding benchmark. The change in benchmarked Net IRR is calculated by subtracting the Benchmarked Net IRR from the previous fund from the Benchmarked Net IRR of the subsequent fund.

Change Multiple

The multiple of a fund is calculated by adding the distributions to paid-in-capital (DPI) to the residual value to paid-in-capital (RVPI). The multiple does not contain a time component in the calculations, but offers a cash-on-cash measure of the amount of money investors receive. The change in the multiple is calculated by subtracting the multiple from the previous fund

from the multiple of the subsequent fund. This performance measure is used in one of the robustness checks performed in this paper.

### 9.1.2 Independent variables

In the regressions performed throughout this paper, multiple independent variables are used.

Growth of fund size

The main independent variable to test the first hypothesis is fund growth, which is measured as the percentage growth in fund size between two consecutive funds within the same fund family. As fund growth probably not has a linear effect on performance, the growth of fund size is divided into five bins which have roughly an equal number of fund observations in each bin. The bins are divided as follows: Bin 1: Less than 2.1%, Bin 2: 2.1% to 44.4%, Bin 3: 44.4% to 75.1%, Bin 4: 75.1% to 128.7 %, Bin 5: more than 128.7%. In Panel A of Table 5 (*Appendix 4*) an overview of the number of funds in each bin can be found. Also, this table provides the mean Change Net IRR and the mean Change Benchmarked Net IRR per bin.

Expected growth

In order to test the second hypothesis, a variable is created that accounts for expected growth. Expected growth of the fund is calculated by subtracting the fund size of the previous fund from the target fund size, and then dividing by the previous fund's fund size. The expected growth is therefore also expressed as a percentage. Throughout this paper the expected growth variable is also divided into five bins which have roughly an equal number of fund observations in each bin. The bins are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8 %, Bin 5: more than 112.8%. In Panel B of Table 5 (*Appendix 4*) an overview of the number of funds in each bin can be found. Also, within this table the mean Change Net IRR and the mean Change Benchmarked Net IRR are provided per bin.

Unexpected growth

The unexpected growth is calculated by subtracting the previously calculated expected growth rate from the realized growth rate of the fund. So, a negative unexpected growth rate means that the growth of the fund is less than expected, an unexpected growth rate of zero means that the growth of the fund is exactly as expected, and a positive unexpected growth rate means that the growth is larger than expected. The variable for unexpected growth is also divided into 5

bins. However, as shown in Figure 3 (*Appendix 1*) quite a lot of funds have an unexpected growth of zero. Therefore, the bins are not equal in number of fund observations but more centered around the bin for zero unexpected growth. The bins for unexpected growth are created as follows: Bin 1: Less than -25%, Bin 2: -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5 %, Bin 5: more than 26.5%. In Panel C of Table 5 (*Appendix 4)* an overview of the number of funds in each bin can be found. Also, within this table the mean Change Net IRR and the mean Change Benchmarked Net IRR are provided per bin.

### 9.1.3 Control variables

In this paper also multiple control variables are used in the regression analyses. These are factors that could clarify the relationship between fund growth and fund returns (Humphery-Jenner, 2012). Due to data limitations it is impossible to control for all factors that influence returns. For instance, there is no useful information on the industry of a fund or data on the number of employees within the database that is used for this paper. Therefore, these could not be used as control variables although they could affect performance.

Fund size

As discussed in the literature review, fund size seems to be an important determinant of fund performance. According to Phalippou & Zollo (2005) "size is an important characteristic that captures several performance-related dimensions such as reputation, economies of scale, and learning" (p.14). As bigger funds are often involved in more deals than smaller funds, they argue that bigger funds could learn quicker. However, they mention that a potential downside for bigger funds could be that it may be more difficult for them to find lucrative deals. Other previous research also find that fund size has an effect on fund performance, but as is discussed in the literature review this research is dispersed about the direction and functional form of the relationship. Hence, as fund size seems to have an impact on performance it is included as a control variable in the various regression analyses throughout this paper. The log of fund size is used to make its distribution more normal.

VC Dummy

Previous literature often looks at VC and Buyout funds separately. When Kaplan and Schoar (2005) asses PE returns on a size-weighted basis instead of an equal-weighted basis, they find that VC funds outperform Buyout funds. This could be explained by the fact that during the 1990s smaller Buyout funds outperformed the larger Buyout funds, while this was precisely

the other way around for VC funds. However, Phalippou and Gottschalg (2009) do not find a significant difference in performance between Buyouts funds and VC funds. To capture the possible difference between performance of VC and Buyout funds, a VC dummy variable is included in the regression analyses.

Capital Inflow

Previous research finds a negative relation between the inflow of capital and subsequent performance by PE funds. Therefore, in this paper the aggregate inflow of capital per investment type measured per vintage year is included to control for this effect. In the regressions throughout this paper the log of capital inflow is used to make its distribution more normal.

Performance of the previous fund

Multiple prior research papers show that fund performance persistence exists within the PE industry. By using samples with earlier vintage years, Kaplan and Schoar (2005) and Phalippou and Gottschalg (2009) show the existence of fund performance. However, Braun, Jenkinson and Stoff (2017) argue that this persistence has weakened the last decade. In this paper previous fund performance is still used as a control variable, because the sample that is used in this paper also contains funds with earlier vintage years.

Fund sequence

Fund sequence might reveal information about the experience of general partners. If a PE firm has already managed multiple funds, it could be argued that this firm has more knowledge and experience than a PE firm that just raised its first fund. The same arguments could be given for later funds within a fund family. The higher the fund sequence the more experience a PE firm has. Therefore, in this paper a control variable is added that accounts for the fund sequence number of all the funds that a PE firm manages. The fund sequence number variable is created by assigning the fund sequence number per PE firm on chronological order based on a fund's vintage year. However, it should be mentioned that if the first fund of a PE firm in the database was named as a second fund this fund is not taken into account as the first fund, in order to try to avoid any bias in the results. In the regressions throughout this paper the log fund sequence is used, as this is also done by Kaplan and Schoar (2005) and Robinson and Sensoy (2011).

Region focus

To account for differences in performance due to the fact that funds are focussed on different regions, region focus is included as a control variable. This is done by including the variable that indicates the region focus as a factor variable in the regression.

Vintage

To capture the effect of aggregate time trends such as economic fluctuations and inflation, vintage fixed effects are included in this paper.

**Figure 1**

Histogram of Fund Growth. Fund Growth is the growth rate between the realized fund size of a fund and the previous fund size of a fund within the same fund family.

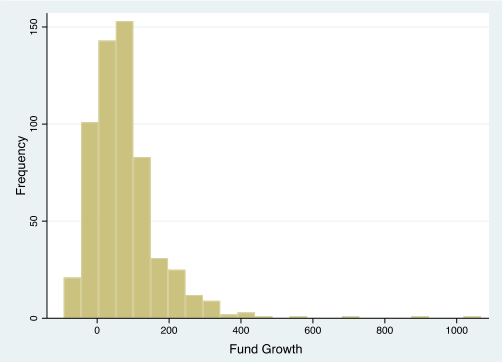



**Figure 2**

Histogram of Expected Growth. Fund Expected Growth is the percentage growth a fund expects from its previous fund. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage.

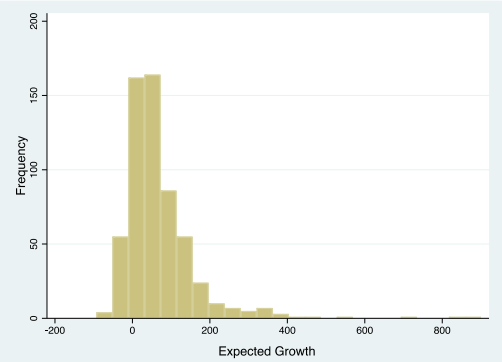
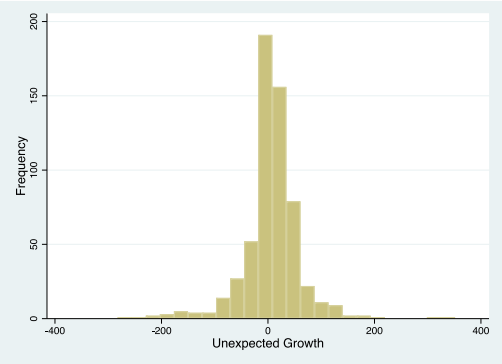



**Figure 3**

Histogram of Unexpected Growth. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage.



# Appendix 2

**Table 3**

**Descriptive Statistics**

This table provides summary statistics for Buyout, VC, US, EU and other region focused funds separately. The final sample is divided in two investment types: Buyout and VC Funds. Buyout funds are further divided into Buyout, Mezzanine, Expansion / Late Stage and Balanced. VC funds are further divided into Early Stage, Early Stage: Seed, Early Stage: Start-up, Venture (General) and Venture Debt. Furthermore, the sample is divided into seven different region focusses: US, EU, Americas, Asia, Australasia, Diversified Multi-Regional and Middle East & Israel. The last 5 are combined in the category Other Region Focused Funds, as these groups contain only a limited number of observations.

| Variable | No. | Min | First quartile | Median | Third quartile | Max | Mean | Standard Deviation |
|---|---|---|---|---|---|---|---|---|
| **Expected Fund Growth** | | | | | | | | |
| Buyout Funds | 395 | -67.3 | 23.7 | 59.09 | 102.7 | 852.4 | 77.9 | 92.0 |
| VC Funds | 193 | -93.1 | -2.5 | 29.03 | 68.5 | 900.0 | 53.3 | 106.6 |
| US Funds | 412 | -60.0 | 7.8 | 38.91 | 74.5 | 900.0 | 55.4 | 91.2 |
| EU Funds | 130 | -67.3 | 44.1 | 82.33 | 128.7 | 716.1 | 100.7 | 99.3 |
| Other Region Focused Funds | 46 | -93.1 | 42.9 | 79.9 | 166.7 | 466.8 | 111.8 | 116.7 |
| **Unexpected Fund Growth** | | | | | | | | |
| Buyout Funds | 395 | -282.3 | -4.8 | 13.02 | 38.9 | 351.3 | 13.5 | 59.4 |
| VC Funds | 193 | -238.5 | -17.7 | 0 | 18.2 | 110.5 | -5.1 | 43.8 |
| US Funds | 412 | -282.3 | -10.0 | 5.816 | 28.6 | 178.6 | 4.6 | 50.9 |
| EU Funds | 130 | -169.4 | -13.6 | 6.762 | 30.8 | 351.3 | 8.9 | 58.4 |
| Other Region Focused Funds | 46 | -238.5 | -4.8 | 18.2 | 53.7 | 314.3 | 27.7 | 77.8 |
| **Net IRR** | | | | | | | | |
| Buyout Funds | 395 | -28.0 | 7.7 | 11.5 | 18.0 | 94.0 | 13.6 | 12.1 |
| VC Funds | 193 | -32.3 | -0.5 | 6.7 | 16.70 | 102.2 | 9.0 | 16.8 |
| US Funds | 412 | -32.3 | 4.9 | 10.3 | 17.10 | 102.2 | 11.7 | 14.3 |
| EU Funds | 130 | -28.0 | 7.4 | 11.2 | 18.60 | 67.70 | 13.6 | 14.1 |
| Other Region Focused Funds | 46 | -9.7 | 5.2 | 10.7 | 17.0 | 36.0 | 10.8 | 9.8 |
| **Changed Net IRR** | | | | | | | | |
| Buyout Funds | 395 | -219.3 | -12.7 | -1.7 | 6.6 | 103.7 | -3.5 | 21.4 |
| VC Funds | 193 | -167.1 | -4.5 | 5.0 | 12.2 | 71.4 | 3.8 | 22.6 |
| US Funds | 412 | -167.1 | -7.2 | 1.5 | 9.3 | 103.7 | 1.2 | 20.1 |
| EU Funds | 130 | -219.3 | -19.7 | -4.0 | 7.7 | 57.8 | -6.9 | 28.3 |
| Other Region Focused Funds | 46 | -35.70 | -14.0 | -1.7 | 6.0 | 15.5 | -4.9 | 13.6 |

# Appendix 3

**Table 4**

**Variables description**

This table provides a brief description of all the variables that are used throughout this paper. All the variables within this paper are obtained from Preqin or created manually.

| Variable | |
|---|---|
| Net IRR | The Net Internal Rate of Return calculated on a money-weighted base expressed as a percentage. Any fees earned by the general partner are excluded. |
| Benchmarked Net IRR | The difference between the Net IRR of the fund and the Net IRR of the appropriate benchmark group. |
| Multiple | The multiple is calculated as follows: (distributed value + residual value) / paid-in capital |
| Change Net IRR | The percentage point change in Net IRR between two subsequent funds. |
| Change Benchmarked Net IRR | The percentage point change in Diff Net IRR between two subsequent funds. |
| Change Multiple | The change in Multiple between two subsequent funds. It is calculated by subtracting the multiple of the subsequent fund from the multiple of the previous fund. |
| Fund Growth | The growth rate between the realized fund size of a fund and the previous fund size of a fund within the same fund family. |
| Expected Fund Growth | This variable is calculated as follows: (Target Fund Size - Fund Size of the Previous Fund) / Fund Size of the Previous Fund. Therefore, the variable is expressed as a percentage. |
| Unexpected Fund Growth | This variable is calculated as follows: Realized Fund Growth – Expected Fund Growth, and therefore also expressed a percentage. |
| Fund size | The fund size is measured as the realized fund size of a fund in millions of US dollars. |
| VC Dummy | A dummy variable indicating whether the fund is a VC fund. |
| Capital inflow | The aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year and in millions of US dollars. |
| Fund Sequence Firm | The fund sequence number of all the funds raised by the firm. |
| Region Focus | The region on which the fund is focused. |
| Vintage | The year in which the firm makes it first investment using capital committed by the limited partners |

## Appendix 4

**Table 5**

This table provides the number of funds in each bin for the variables Growth of Fund Size, Expected Growth and Unexpected Growth. Also, it provides the mean Change Net IRR and the mean Change Benchmarked Net IRR per bin.

| **Panel A:** Growth of Fund Size | Number of fund observations | Mean Change Net IRR | Mean Change Benchmarked Net IRR |
|---|---|---|---|
| Bin 1: Less than 2.1% | 118 | 5.42 | 1.93 |
| Bin 2: 2.1% to 44.4% | 118 | 3.53 | 0.90 |
| Bin 3: 44.4% to 75.1% | 118 | 0.36 | 0.05 |
| Bin 4: 75.1% to 128.7% | 117 | -3.36 | -1.58 |
| Bin 5: More than 128.7% | 117 | -11.46 | -8.20 |
| **Panel B:** Expected Growth | Number of fund observations per bin | Mean Change Net IRR | Mean Change Benchmarked Net IRR |
| Bin 1: Less than 7% | 118 | 2.57 | -0.25 |
| Bin 2: 7% to 36% | 118 | 1.95 | 1.76 |
| Bin 3: 36% to 66.6% | 115 | 0.46 | -0.87 |
| Bin 4: 66.6% to 112.8 % | 119 | -5.34 | -4.11 |
| Bin 5: More than 112.8% | 118 | -4.97 | -3.35 |
| **Panel C:** Unexpected Growth | Number of fund observations per bin | Mean Change Net IRR | Mean Change Benchmarked Net IRR |
| Bin 1: Less than -25% | 92 | 4.21 | 1.54 |
| Bin 2: - 25% to -1% | 92 | 1.23 | -1.18 |
| Bin 3: -1% to 1% | 62 | 2.77 | 1.35 |
| Bin 4: 1% to 26.5% | 172 | -0.26 | 0.22 |
| Bin 5: More than 26.5% | 170 | -7.43 | -5.65 |

# Appendix 5

**Table 10**

This table provides the number of funds in each subgroup for each bin of Expected and Unexpected Growth. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%.

| | Number of observations per subgroup | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Variables | (1) (<$152mln) | (2) ($152mln-$332mln) | (3) ($332mln-$775mln) | (4) (>$775 mln) | (5) VC | (6) Buyout | (7) Region Focus US | (8) Region Focus EU | (9) Region Focus Non-US & EU |
| Fund Expected Growth Bin = 1 | 16 | 21 | 37 | 44 | 64 | 54 | 99 | 11 | 8 |
| Fund Expected Growth Bin = 2 | 7 | 35 | 44 | 32 | 42 | 76 | 100 | 16 | 2 |
| Fund Expected Growth Bin = 3 | 24 | 39 | 30 | 22 | 33 | 82 | 86 | 22 | 7 |
| Fund Expected Growth Bin = 4 | 37 | 35 | 21 | 26 | 20 | 99 | 68 | 39 | 12 |
| Fund Expected Growth Bin = 5 | 62 | 18 | 15 | 23 | 34 | 84 | 59 | 42 | 17 |
| Total number of Observations | 146 | 148 | 147 | 147 | 193 | 395 | 412 | 130 | 46 |
| Fund Unexpected Growth Bin = 1 | 36 | 24 | 17 | 15 | 35 | 57 | 65 | 21 | 6 |
| Fund Unexpected Growth Bin = 2 | 28 | 20 | 19 | 25 | 44 | 48 | 64 | 22 | 6 |
| Fund Unexpected Growth Bin = 3 | 16 | 12 | 14 | 20 | 33 | 29 | 49 | 9 | 4 |
| Fund Unexpected Growth Bin = 4 | 25 | 48 | 51 | 48 | 50 | 122 | 123 | 39 | 10 |
| Fund Unexpected Growth Bin = 5 | 41 | 44 | 46 | 39 | 31 | 139 | 111 | 39 | 20 |
| Total number of Observations | 146 | 148 | 147 | 147 | 193 | 395 | 412 | 130 | 46 |

# Appendix 6

**Table 11**

This table displays the results of OLS regressions, where the sample is divided into subgroups based on the previous fund's fund size. The sample is divided into the following subgroups: Small funds (<$152mln), midsized funds (<$152mln-$332mln), large funds ($332mln-$775mln) and mega funds (>$775mln). The dependent variables are Change Net IRR and Change Benchmarked Net IRR. Change Net IRR and Change Benchmarked Net IRR is the percentage point difference in the Net IRR or Benchmarked Net IRR between two subsequent funds. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%. Fund Size is the realized fund size of a fund in millions of US dollars. VC Dummy is a dummy variable equal to 1 if the fund is a VC fund and 0 if the fund is a Buyout fund. Capital Inflow is the aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year and in millions of US dollars. Fund Sequence Firm is the fund sequence number of all funds raised by the firm.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Change Net IRR | Change Benchmarked Net IRR | Change Net IRR | Change Benchmarked Net IRR | Change Net IRR | Change Benchmarked Net IRR | Change Net IRR | Change Benchmarked Net IRR |
| Variables | (<$152mln) | (<$152mln) | ($152mln-$332mln) | ($152mln-$332mln) | ($332mln-$775mln) | ($332mln-$775mln) | (>$775mln) | (>$775mln) |
| Fund Expected Growth Bin = 1 | -23.0388 | -23.3358 | -0.0614 | 2.9876 | 6.7246 | 5.2674 | 5.8826 | 7.3534 |
| | (24.507) | (22.765) | (11.711) | (10.609) | (6.024) | (5.594) | (4.755) | (4.591) |
| Fund Expected Growth Bin = 2 | -8.1444 | -12.8392* | 3.9382 | 6.3960 | 5.5260 | 5.1051 | 10.0348** | 11.9834*** |
| | (8.165) | (7.606) | (9.830) | (9.114) | (4.879) | (4.828) | (4.106) | (4.162) |
| Fund Expected Growth Bin = 3 | -6.5096 | -7.6469 | 5.0383 | 4.4558 | 6.7524 | 6.8217 | 5.1854 | 6.1790 |
| | (5.584) | (5.597) | (7.835) | (7.076) | (5.150) | (5.167) | (3.937) | (3.825) |
| Fund Expected Growth Bin = 4 | -8.1047 | -9.8039 | 0.2574 | -2.0809 | 3.6818 | 5.5008 | 4.8833 | 5.2399 |
| | (6.651) | (6.616) | (6.867) | (6.161) | (4.829) | (4.338) | (3.992) | (3.962) |
| Fund Unexpected Growth Bin = 1 | 5.7602 | 1.0483 | -4.6270 | -1.5621 | -3.6948 | -2.0188 | 10.0610** | 9.6891** |
| | (9.268) | (8.739) | (5.502) | (5.050) | (6.368) | (6.451) | (4.295) | (4.560) |
| Fund Unexpected Growth Bin = 2 | 6.9437 | 4.4043 | -1.9541 | -0.2602 | 0.7179 | 0.0270 | 12.1017*** | 10.4886*** |
| | (9.560) | (9.435) | (5.743) | (5.206) | (3.654) | (3.615) | (3.664) | (3.573) |
| Fund Unexpected Growth Bin = 3 | 12.4601 | 11.2858 | -2.7004 | 1.3939 | 4.4743 | 2.9511 | 9.8524*** | 6.4070* |
| | (10.396) | (10.993) | (3.930) | (3.938) | (5.679) | (5.923) | (3.570) | (3.420) |
| Fund Unexpected Growth Bin = 4 | 14.1379 | 12.4488 | -1.1042 | -0.7075 | 2.4390 | 4.1901 | 4.7300 | 3.9625 |
| | (8.689) | (8.483) | (3.535) | (3.382) | (3.123) | (3.015) | (3.153) | (3.239) |
| Log(Fund Size) | -1.8317 | -2.7173 | -2.0985 | -0.4961 | -11.6166** | -11.3490** | 1.5738 | 1.6589 |
| | (4.422) | (4.191) | (4.873) | (4.644) | (4.849) | (4.736) | (2.175) | (2.051) |
| VC Dummy | -56.5122* | -41.5339 | -17.4804 | -3.8843 | -5.4043 | 16.6229 | -24.0740 | -3.1063 |
| | (32.807) | (31.650) | (13.613) | (13.785) | (13.316) | (13.336) | (24.551) | (20.657) |
| Log(Capital Inflow) | -26.5233* | -17.5372 | -12.3879* | -3.7072 | -2.0665 | 10.7565* | -13.2222 | -0.9210 |
| | (14.567) | (14.089) | (6.326) | (6.455) | (5.689) | (5.615) | (11.529) | (9.938) |
| Log(Fund Sequence Firm) | 1.6261 | 2.8685 | 0.1098 | -0.3244 | 6.5557** | 6.9793** | 0.1240 | -0.8903 |
| | (6.145) | (6.391) | (3.163) | (2.984) | (3.309) | (3.073) | (2.430) | (2.391) |
| Constant | 310.8768** | 219.1039 | 158.0071** | 45.7721 | 81.9234 | -93.0083 | 126.6628 | -26.8506 |
| | (141.099) | (135.731) | (79.067) | (76.216) | (76.461) | (74.794) | (129.616) | (111.260) |
| Observations | 146 | 146 | 148 | 148 | 147 | 147 | 147 | 147 |
| R-squared | 0.418 | 0.331 | 0.260 | 0.187 | 0.412 | 0.268 | 0.456 | 0.251 |
| Region Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

# Appendix 7

**Table 12**

This table displays the predictive margins using the results from the regressions performed in Table 11, where the sample is divided into subgroups based on the previous fund's fund size. Each column number corresponds to the specification number in Table 11. The sample is divided into the following subgroups: Small funds (<$152mln), midsized funds (<$152mln-$332mln), large funds ($332mln-$775mln) and mega funds (>$775mln). Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%.

| | (1) Change Net IRR | (2) Change Benchmarked Net IRR | (3) Change Net IRR | (4) Change Benchmarked Net IRR | (5) Change Net IRR | (6) Change Benchmarked Net IRR | (7) Change Net IRR | (8) Change Benchmarked Net IRR |
|---|---|---|---|---|---|---|---|---|
| Fund Growth Bins | (<$152mln) | (<$152mln) | ($152mln-$332mln) | ($152mln-$332mln) | ($332mln-$775mln) | ($332mln-$775mln) | (>$775mln) | (>$775mln) |
| Fund Expected Growth Bin = 1 | -21.1200 | -20.3495 | -2.6341 | -0.3815 | 3.6364 | 1.1793 | -2.0685 | -1.3456 |
| | (22.235) | (20.640) | (6.230) | (5.742) | (2.975) | (2.704) | (2.386) | (2.322) |
| Fund Expected Growth Bin = 2 | -6.1150 | -9.6664 | 1.3840 | 3.0558 | 2.7286 | 1.3286 | 2.0773 | 3.3034** |
| | (6.412) | (5.942) | (4.725) | (4.750) | (2.009) | (2.017) | (1.705) | (1.622) |
| Fund Expected Growth Bin = 3 | -4.4863 | -4.4947 | 2.4383 | 1.0553 | 3.8715 | 2.9559 | -2.7743 | -2.5037 |
| | (4.331) | (4.458) | (2.108) | (1.930) | (3.610) | (3.556) | (1.872) | (1.592) |
| Fund Expected Growth Bin = 4 | -6.2009 | -6.8383 | -2.3238 | -5.4575* | 0.9424 | 1.7892 | -3.0692 | -3.4551* |
| | (4.735) | (4.720) | (3.835) | (3.281) | (3.105) | (2.536) | (2.229) | (1.994) |
| Fund Expected Growth Bin = 5 | 1.8940 | 2.9459 | -2.5659 | -3.3548 | -2.5763 | -3.5360 | -7.9534** | -8.6735** |
| | (3.958) | (3.911) | (7.088) | (6.355) | (4.209) | (4.135) | (3.585) | (3.605) |
| Fund Unexpected Growth Bin = 1 | -4.9155 | -7.3841 | -3.3133 | -1.9301 | -2.3213 | -2.4226 | 1.7172 | 2.7014 |
| | (6.947) | (6.551) | (4.517) | (4.151) | (4.872) | (5.039) | (3.253) | (3.352) |
| Fund Unexpected Growth Bin = 2 | -3.7626 | -4.0713 | -0.6223 | -0.5957 | 1.9478 | -0.5276 | 3.7694 | 3.5202 |
| | (5.833) | (5.742) | (5.214) | (4.582) | (2.384) | (2.328) | (2.464) | (2.269) |
| Fund Unexpected Growth Bin = 3 | 1.8884 | 3.0355 | -1.3534 | 1.0737 | 5.9044 | 2.6105 | 1.5311 | -0.5568 |
| | (8.673) | (9.022) | (2.907) | (3.020) | (4.722) | (4.955) | (2.352) | (2.012) |
| Fund Unexpected Growth Bin = 4 | 3.4586 | 4.0193 | 0.2298 | -1.0435 | 3.9641** | 3.9522** | -3.6094* | -2.9984 |
| | (5.617) | (5.627) | (2.744) | (2.660) | (1.875) | (1.789) | (2.156) | (2.054) |
| Fund Unexpected Growth Bin = 5 | -10.6041* | -8.3105 | 1.3154 | -0.3605 | 1.5114 | -0.2522 | -8.3503*** | -6.9581*** |
| | (6.160) | (6.030) | (2.292) | (2.152) | (2.526) | (2.450) | (2.402) | (2.540) |
| Observations | 146 | 146 | 148 | 148 | 147 | 147 | 147 | 147 |
| Region Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

# Appendix 8

**Table 13**

This table displays the results of OLS regressions where the sample is divided into subgroups of VC and Buyout funds. The dependent variables are Change Net IRR and Change Benchmarked Net IRR. Change Net IRR and Change Benchmarked Net IRR is the percentage point difference in the Net IRR or Benchmarked Net IRR between two subsequent funds. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%. Fund Size is the realized fund size of a fund in millions of US dollars. Capital Inflow is the aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year and in millions of US dollars. Fund Sequence Firm is the fund sequence number of all funds raised by the firm.

| Variables | (1)<br>Change Net IRR<br>(Subgroup Buyout Funds) | (2)<br>Change Benchmarked Net IRR<br>(Subgroup Buyout Funds) | (3)<br>Change Net IRR<br>(Subgroup VC Funds) | (4)<br>Change Benchmarked Net IRR<br>(Subgroup VC Funds) |
|---|---|---|---|---|
| Fund Expected Growth Bin = 1 | -0.6884 | 0.3322 | 1.1174 | -0.7057 |
| | (7.711) | (7.230) | (5.618) | (5.765) |
| Fund Expected Growth Bin = 2 | 3.7433 | 4.5132 | 4.5576 | 2.0034 |
| | (3.819) | (3.694) | (6.025) | (6.403) |
| Fund Expected Growth Bin = 3 | 1.5276 | 1.4441 | 1.4904 | 0.3034 |
| | (3.090) | (2.942) | (5.024) | (5.207) |
| Fund Expected Growth Bin = 4 | 1.1315 | 1.1056 | -8.1117 | -8.1922 |
| | (2.799) | (2.669) | (6.529) | (6.864) |
| Fund Unexpected Growth Bin = 1 | 6.8350* | 6.1496* | 0.7273 | 1.0896 |
| | (3.601) | (3.439) | (5.685) | (5.641) |
| Fund Unexpected Growth Bin = 2 | 5.5507 | 4.4898 | 1.0543 | 1.5279 |
| | (3.858) | (3.617) | (4.300) | (4.592) |
| Fund Unexpected Growth Bin = 3 | 5.6060* | 4.7253* | 6.2127 | 5.0381 |
| | (2.939) | (2.770) | (5.886) | (6.448) |
| Fund Unexpected Growth Bin = 4 | 4.4272* | 4.6714* | 4.0011 | 2.9298 |
| | (2.646) | (2.547) | (4.355) | (4.637) |
| Log(Fund Size) | -0.0749 | 0.0792 | -2.6220 | -2.3536 |
| | (1.342) | (1.288) | (3.272) | (3.255) |
| Log(Capital Inflow) | -13.4510** | -12.5457*** | -14.4903*** | -12.9233*** |
| | (5.227) | (4.813) | (4.515) | (4.685) |
| Log(Fund Sequence Firm) | 2.0320 | 1.3936 | 4.2665 | 5.0483 |
| | (1.906) | (1.897) | (3.904) | (3.932) |
| Constant | 158.1099*** | 132.7521** | 141.3531*** | 118.4866*** |
| | (59.863) | (55.166) | (31.172) | (33.120) |
| Observations | 395 | 395 | 193 | 193 |
| R-squared | 0.189 | 0.086 | 0.471 | 0.326 |
| Region Fixed Effects | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

# Appendix 9

**Table 14**

This table displays the predictive margins using the results from the regressions performed in Table 13, where the sample is divided into subgroups of VC and Buyout funds. Each column number corresponds to the specification number in Table 13. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%.

| Variables | (1)<br>Change Net IRR<br>(Subgroup Buyout Funds) | (2)<br>Change Benchmarked Net IRR<br>(Subgroup Buyout Funds) | (3)<br>Change Net IRR<br>(Subgroup VC Funds) | (4)<br>Change Benchmarked Net IRR<br>(Subgroup VC Funds) |
|---|---|---|---|---|
| Fund Expected Growth Bin = 1 | -5.4046 | -3.3324 | 4.1864 | 0.1655 |
| | (6.237) | (5.847) | (2.786) | (2.741) |
| Fund Expected Growth Bin = 2 | -0.9730 | 0.8486 | 7.6266** | 2.8747 |
| | (2.296) | (2.296) | (3.055) | (3.235) |
| Fund Expected Growth Bin = 3 | -3.1886* | -2.2205 | 4.5594* | 1.1747 |
| | (1.736) | (1.719) | (2.498) | (2.588) |
| Fund Expected Growth Bin = 4 | -3.5847** | -2.5590 | -5.0427 | -7.3209* |
| | (1.741) | (1.650) | (4.445) | (4.326) |
| Fund Expected Growth Bin = 5 | -4.7162* | -3.6646 | 3.0690 | 0.8713 |
| | (2.495) | (2.325) | (4.484) | (4.849) |
| Fund Unexpected Growth Bin = 1 | -0.0942 | 0.7529 | 2.1019 | -0.8007 |
| | (2.868) | (2.804) | (3.818) | (3.628) |
| Fund Unexpected Growth Bin = 2 | -1.3785 | -0.9069 | 2.4288 | -0.3623 |
| | (3.088) | (2.842) | (2.085) | (2.098) |
| Fund Unexpected Growth Bin = 3 | -1.3231 | -0.6713 | 7.5872* | 3.1479 |
| | (1.924) | (1.787) | (3.982) | (4.267) |
| Fund Unexpected Growth Bin = 4 | -2.5020 | -0.7252 | 5.3756* | 1.0396 |
| | (1.540) | (1.531) | (2.744) | (2.726) |
| Fund Unexpected Growth Bin = 5 | -6.9292*** | -5.3967*** | 1.3745 | -1.8902 |
| | (2.148) | (2.016) | (3.845) | (4.188) |
| Observations | 395 | 395 | 193 | 193 |
| Region Fixed Effects | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

# Appendix 10

**Table 15**

This table displays the results of OLS regressions where the sample is divided into the following subgroups: US Funds, EU Funds and Non-US & EU Funds. The dependent variables are Change Net IRR and Change Benchmarked Net IRR. Change Net IRR and Change Benchmarked Net IRR is the percentage point difference in the Net IRR or Benchmarked Net IRR between two subsequent funds. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%. Fund Size is the realized fund size of a fund in millions of US dollars. Capital Inflow is the aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year and in millions of US dollars. Fund Sequence Firm is the fund sequence number of all funds raised by the firm.

| Variables | (1) Change Net IRR (Subgroup US Funds) | (2) Change Benchmarked Net IRR (Subgroup US Funds) | (3) Change Net IRR (Subgroup EU Funds) | (4) Change Benchmarked Net IRR (Subgroup EU Funds) | (5) Change Net IRR (Subgroup Non-US & EU Funds) | (6) Change Benchmarked Net IRR (Subgroup Non-US & EU Funds) |
|---|---|---|---|---|---|---|
| Fund Expected Growth Bin = 1 | 3.7176 | 2.7931 | -29.8536 | -24.3785 | 16.4919** | 13.9213** |
| | (3.446) | (3.510) | (25.654) | (25.240) | (6.711) | (5.534) |
| Fund Expected Growth Bin = 2 | 3.3935 | 3.2315 | 13.2552* | 14.8208** | 14.0689 | 8.7019 |
| | (3.244) | (3.364) | (7.424) | (7.441) | (14.828) | (14.205) |
| Fund Expected Growth Bin = 3 | 3.2417 | 1.6733 | -1.6996 | -1.2243 | 5.4051 | -4.3038 |
| | (3.141) | (3.210) | (5.543) | (5.126) | (9.235) | (8.275) |
| Fund Expected Growth Bin = 4 | -2.3054 | -2.1671 | -2.5434 | -3.7855 | 5.8313 | -0.0151 |
| | (3.403) | (3.399) | (5.028) | (4.822) | (8.075) | (7.080) |
| Fund Unexpected Growth Bin = 1 | 3.5830 | 3.4300 | 12.3384 | 10.1016 | 9.1382 | 11.2445 |
| | (3.128) | (3.085) | (8.150) | (7.728) | (10.534) | (9.663) |
| Fund Unexpected Growth Bin = 2 | 3.2085 | 3.0187 | 11.2586 | 10.2443 | 3.3072 | 0.6546 |
| | (2.596) | (2.591) | (8.718) | (8.623) | (10.823) | (10.046) |
| Fund Unexpected Growth Bin = 3 | 4.3181 | 4.1632 | 6.4176 | 4.7223 | -7.0228 | 2.1568 |
| | (3.151) | (3.251) | (8.648) | (7.945) | (12.998) | (11.005) |
| Fund Unexpected Growth Bin = 4 | 2.5147 | 3.0268 | 15.5152** | 16.2089** | -2.9531 | -5.8726 |
| | (2.135) | (2.134) | (6.829) | (6.569) | (6.699) | (5.883) |
| Log(Fund Size) | -1.5784 | -1.7146 | 0.3214 | 1.0475 | -0.7324 | -2.8148 |
| | (1.101) | (1.085) | (2.361) | (2.337) | (3.290) | (2.795) |
| VC Dummy | -27.2762*** | -9.1952 | 13.2415 | 29.5660 | -57.3396* | -68.0962** |
| | (10.125) | (9.697) | (41.691) | (42.899) | (33.290) | (25.639) |
| Log(Capital Inflow) | -13.5735*** | -2.9107 | 0.4609 | 9.5037 | -28.0258* | -28.6590** |
| | (4.363) | (4.222) | (17.062) | (17.462) | (14.141) | (11.850) |
| Log(Fund Sequence Firm) | 1.9902 | 1.8847 | 3.1291 | 2.2299 | 1.3985 | 4.8186 |
| | (2.105) | (2.117) | (3.444) | (3.392) | (6.103) | (4.520) |
| Constant | 158.9771*** | 53.7145 | 13.9177 | -85.1440 | 268.0805* | 302.8086** |
| | (40.877) | (39.401) | (177.367) | (181.551) | (156.261) | (124.835) |
| Observations | 412 | 412 | 130 | 130 | 46 | 46 |
| R-squared | 0.343 | 0.185 | 0.313 | 0.225 | 0.359 | 0.316 |
| Region Fixed Effects | No | No | No | No | No | No |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

# Appendix 11

**Table 16**

This table displays the predictive margins using the results from the regressions performed in Table 15, where the sample is divided into the following subgroups: US Funds, EU Funds and Non-US & EU Funds. Each column number corresponds to the specification number in Table 15. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%.

| Variables | (1) Change Net IRR (Subgroup US Funds) | (2) Change Benchmarked Net IRR (Subgroup US Funds) | (3) Change Net IRR (Subgroup EU Funds) | (4) Change Benchmarked Net IRR (Subgroup EU Funds) | (5) Change Net IRR (Subgroup Non-US & EU Funds) | (6) Change Benchmarked Net IRR (Subgroup Non-US & EU Funds) |
|---|---|---|---|---|---|---|
| Fund Expected Growth Bin = 1 | 2.8729 | 1.1045 | -34.7698 | -26.4062 | 5.7662 | 6.6351* |
| | (1.954) | (1.914) | (23.939) | (23.473) | (4.900) | (3.756) |
| Fund Expected Growth Bin = 2 | 2.5487* | 1.5429 | 8.3389 | 12.7931** | 3.3432 | 1.4157 |
| | (1.451) | (1.476) | (6.124) | (6.317) | (13.908) | (13.508) |
| Fund Expected Growth Bin = 3 | 2.3970 | -0.0153 | -6.6158* | -3.2520 | -5.3207 | -11.5901 |
| | (1.636) | (1.651) | (3.972) | (3.680) | (7.125) | (6.794) |
| Fund Expected Growth Bin = 4 | -3.1501* | -3.8558** | -7.4596** | -5.8132* | -4.8944 | -7.3013 |
| | (1.868) | (1.674) | (3.299) | (3.308) | (6.389) | (5.523) |
| Fund Expected Growth Bin = 5 | -0.8447 | -1.6886 | -4.9162 | -2.0277 | -10.7258** | -7.2862** |
| | (2.805) | (2.924) | (3.823) | (3.588) | (4.054) | (3.529) |
| Fund Unexpected Growth Bin = 1 | 2.4234 | 0.7796 | -3.5204 | -2.0626 | 3.8653 | 5.6359 |
| | (2.390) | (2.306) | (6.322) | (6.112) | (8.562) | (7.387) |
| Fund Unexpected Growth Bin = 2 | 2.0490 | 0.3684 | -4.6002 | -1.9200 | -1.9656 | -4.9539 |
| | (1.944) | (1.853) | (5.261) | (5.347) | (10.280) | (9.970) |
| Fund Unexpected Growth Bin = 3 | 3.1586 | 1.5128 | -9.4413* | -7.4420* | -12.2956 | -3.4518 |
| | (2.410) | (2.492) | (5.141) | (4.031) | (11.688) | (9.504) |
| Fund Unexpected Growth Bin = 4 | 1.3551 | 0.3765 | -0.3437 | 4.0446 | -8.2259 | -11.4812** |
| | (1.508) | (1.529) | (3.288) | (3.295) | (5.071) | (4.722) |
| Fund Unexpected Growth Bin = 5 | -1.1595 | -2.6503 | -15.8588*** | -12.1643** | -5.2728 | -5.6086 |
| | (1.788) | (1.829) | (5.916) | (5.649) | (3.986) | (3.491) |
| Observations | 412 | 412 | 130 | 130 | 46 | 46 |
| Region Fixed Effects | No | No | No | No | No | No |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

# Appendix 12

**Table 17**

This table displays the results of OLS regressions. The dependent variable is Change Multiple, which is the difference in the Multiple between two subsequent funds. Fund Growth is the growth rate between the realized fund size of a fund and the previous fund size of a fund within the same fund family. Fund growth is divided in the following bins: Bin 1: Less than 2.1%, Bin 2: 2.1% to 44.4%, Bin 3: 44.4% to 75.1%, Bin 4: 75.1% to 128.7%, Bin 5: More than 128.7%. Fund Size is the realized fund size of a fund in millions of USD. VC Dummy is a dummy variable equal to 1 if the fund is a VC fund and 0 if the fund is a Buyout fund. Capital Inflow is the aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year and in millions of USD. Fund Sequence Firm is the fund sequence number of all funds raised by the firm.

| Variables | (1)<br>Change Multiple | (2)<br>Change Multiple | (3)<br>Change Multiple |
|---|---|---|---|
| Fund Growth Bin = 1 | 0.5265*** | 0.5433*** | 0.5528*** |
| | (0.115) | (0.106) | (0.119) |
| Fund Growth Bin = 2 | 0.3711** | 0.4003*** | 0.4069*** |
| | (0.149) | (0.132) | (0.143) |
| Fund Growth Bin = 3 | 0.3792*** | 0.3823*** | 0.3931*** |
| | (0.107) | (0.100) | (0.112) |
| Fund Growth Bin = 4 | 0.1535 | 0.1929* | 0.1979* |
| | (0.113) | (0.104) | (0.108) |
| Log(Fund Size) | 0.0399 | 0.0289 | 0.0308 |
| | (0.032) | (0.030) | (0.030) |
| VC Dummy | -0.0074 | -0.9130*** | -0.8980*** |
| | (0.161) | (0.328) | (0.338) |
| Log(Capital Inflow) | -0.1262** | -0.5395*** | -0.5404*** |
| | (0.055) | (0.159) | (0.163) |
| Log(Firm Fund Number) | 0.0705 | 0.0871 | 0.0861 |
| | (0.072) | (0.071) | (0.071) |
| Constant | 0.6045 | 5.8829*** | 5.2465*** |
| | (0.677) | (1.470) | (1.531) |
| Observations | 660 | 660 | 660 |
| R-squared | 0.076 | 0.192 | 0.197 |
| Region Fixed Effects | No | No | Yes |
| Year fixed effects | No | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

**Table 18**

This table displays the predictive margins using the results from the regressions performed in Table 17. Each column number corresponds to the specification number in Table 17. Fund Growth is the growth rate between the realized fund size of a fund and the previous fund size of a fund within the same fund family. Fund growth is divided in the following bins: Bin 1: Less than 2.1%, Bin 2: 2.1% to 44.4%, Bin 3: 44.4% to 75.1%, Bin 4: 75.1% to 128.7%, Bin 5: More than 128.7%.

| Variables | (1)<br>Change Multiple | (2)<br>Change Multiple | (3)<br>Change Multiple |
|---|---|---|---|
| Fund Growth Bin = 1 | 0.0901 | 0.0893 | 0.0922 |
| | (.0654) | (0.068) | (0.071) |
| Fund Growth Bin = 2 | -0.0657 | -0.0543 | -0.0541 |
| | (0.116) | (0.106) | (0.108) |
| Fund Growth Bin = 3 | -0.0578 | -0.0724 | -0.0676 |
| | (0.0716) | (0.068) | (0.069) |
| Fund Growth Bin = 4 | -0.2830*** | -0.2612*** | -0.2624*** |
| | (0.079) | (0.080) | (0.081) |
| Fund Growth Bin = 5 | -0.4365*** | -0.4542*** | -0.4607*** |
| | (0.085) | (0.074) | (0.082) |
| Observations | 660 | 660 | 660 |
| Region Fixed Effects | No | No | Yes |
| Year fixed effects | No | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

# Appendix 13

**Table 19**

This table displays the results of OLS regressions. The dependent variable is Change Multiple, which is the difference in the Multiple between two subsequent funds. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%. Fund Size is the realized fund size of a fund in millions of US dollars. VC Dummy is a dummy variable equal to 1 if the fund is a VC fund and 0 if the fund is a Buyout fund. Capital Inflow is the aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year and in millions of US dollars. Fund Sequence Firm is the fund sequence number of all funds raised by the firm.

| | (1) | (2) | (3) |
|---|---|---|---|
| Variables | Change Multiple | Change Multiple | Change Multiple |
| Fund Expected Growth Bin = 1 | 0.2609* | 0.2814* | 0.2772* |
| | (0.136) | (0.144) | (0.152) |
| Fund Expected Growth Bin = 2 | 0.3649*** | 0.3960*** | 0.3886*** |
| | (0.116) | (0.108) | (0.121) |
| Fund Expected Growth Bin = 3 | 0.2183** | 0.2243** | 0.2174** |
| | (0.099) | (0.097) | (0.103) |
| Fund Expected Growth Bin = 4 | 0.1274 | 0.0950 | 0.0950 |
| | (0.114) | (0.105) | (0.106) |
| Fund Unexpected Growth Bin = 1 | 0.4111*** | 0.4041*** | 0.3972*** |
| | (0.114) | (0.112) | (0.115) |
| Fund Unexpected Growth Bin = 2 | 0.2683** | 0.2167* | 0.2077* |
| | (0.118) | (0.113) | (0.114) |
| Fund Unexpected Growth Bin = 3 | 0.2407* | 0.1539 | 0.1422 |
| | (0.145) | (0.128) | (0.129) |
| Fund Unexpected Growth Bin = 4 | 0.1617 | 0.1354 | 0.1317 |
| | (0.098) | (0.084) | (0.085) |
| Log(Fund Size) | 0.0397 | 0.0287 | 0.0293 |
| | (0.035) | (0.032) | (0.033) |
| VC Dummy | -0.0307 | -0.9439*** | -0.9414*** |
| | (0.167) | (0.325) | (0.333) |
| Log(Capital Inflow) | -0.1374** | -0.5585*** | -0.5621*** |
| | (0.057) | (0.157) | (0.161) |
| Log(Firm Fund Number) | 0.0876 | 0.1041 | 0.1055 |
| | (0.072) | (0.072) | (0.072) |
| Constant | 0.6236 | 6.1332*** | 5.6267*** |
| | (0.699) | (1.420) | (1.465) |
| Observations | 660 | 660 | 660 |
| R-squared | 0.073 | 0.192 | 0.197 |
| Region Fixed Effects | No | No | Yes |
| Year fixed effects | No | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

# Appendix 14

**Table 20**

This table displays the predictive margins using the results from the regressions performed in Table 19. Each column number corresponds to the specification number in Table 19. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%.

| | (1) | (2) | (3) |
|---|---|---|---|
| Variables | Change Multiple | Change Multiple | Change Multiple |
| Fund Expected Growth Bin = 1 | -0.082 | -0.0669 | -0.0675 |
| | (0.105) | (0.117) | (0.120) |
| Fund Expected Growth Bin = 2 | 0.0219 | 0.0476 | 0.0439 |
| | (0.086) | (0.075) | (0.080) |
| Fund Expected Growth Bin = 3 | -0.1248* | -0.1241* | -0.1273* |
| | (0.066) | (0.065) | (0.067) |
| Fund Expected Growth Bin = 4 | -0.2157** | -0.2533*** | -0.2498*** |
| | (0.087) | (0.077) | (0.078) |
| Fund Expected Growth Bin = 5 | -0.3430*** | -0.3484*** | -0.3447*** |
| | (0.074) | (0.071) | (0.076) |
| Fund Unexpected Growth Bin = 1 | 0.0773 | 0.0965 | 0.0945 |
| | (0.075) | (0.081) | (0.082) |
| Fund Unexpected Growth Bin = 2 | -0.0655 | -0.0908 | -0.0950 |
| | (0.082) | (0.083) | (0.084) |
| Fund Unexpected Growth Bin = 3 | -0.0932 | -0.1537 | -0.1604 |
| | (0.120) | (0.110) | (0.112) |
| Fund Unexpected Growth Bin = 4 | -0.1721** | -0.1721** | -0.1710** |
| | (0.077) | (0.080) | (0.079) |
| Fund Unexpected Growth Bin = 5 | -0.3338*** | -0.3076*** | -0.3027*** |
| | (0.077) | (0.064) | (0.065) |
| Observations | 660 | 660 | 660 |
| Region Fixed Effects | No | No | Yes |
| Year fixed effects | No | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

# Appendix 15

**Table 21**

This table displays the results of OLS regressions, where only funds are included in the sample that have been investing for at least 8 years. The dependent variables are Change Net IRR and Change Benchmarked Net IRR. Change Net IRR and Change Benchmarked Net IRR is the percentage point difference in the Net IRR or Benchmarked Net IRR between two subsequent funds. Fund Growth is the growth rate between the realized fund size of a fund and the previous fund size of a fund within the same fund family. Fund growth is divided in the following bins: Bin 1: Less than 2.1%, Bin 2: 2.1% to 44.4%, Bin 3: 44.4% to 75.1%, Bin 4: 75.1% to 128.7%, Bin 5: More than 128.7%. Fund Size is the realized fund size of a fund in millions of USD. VC Dummy is a dummy variable equal to 1 if the fund is a VC fund and 0 if the fund is a Buyout fund. Capital Inflow is the aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year and in millions of USD. Fund Sequence Firm is the fund sequence number of all funds raised by the firm.

| Variables | (1)<br>Change Net IRR | (2)<br>Change Benchmarked Net IRR |
|---|---|---|
| Fund Growth Bin = 1 | 9.9347*** | 8.3208** |
| | (3.466) | (3.267) |
| Fund Growth Bin = 2 | 8.5649** | 7.5480** |
| | (3.477) | (3.480) |
| Fund Growth Bin = 3 | 10.7894*** | 9.5992*** |
| | (3.425) | (3.272) |
| Fund Growth Bin = 4 | 8.0675** | 7.6402** |
| | (3.630) | (3.465) |
| Log(Fund Size) | -0.8423 | -0.6857 |
| | (1.356) | (1.301) |
| VC Dummy | -24.0925** | 0.6693 |
| | (10.327) | (10.301) |
| Log(Capital Inflow) | -13.3569*** | -0.0738 |
| | (4.625) | (4.614) |
| Log(Firm Fund Number) | 4.9544** | 4.6309** |
| | (2.009) | (2.034) |
| Constant | 132.4450*** | -6.0283 |
| | (42.034) | (41.754) |
| Observations | 410 | 410 |
| R-squared | 0.274 | 0.147 |
| Region Fixed Effects | Yes | Yes |
| Year fixed effects | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

# Appendix 16

**Table 22**

This table displays the predictive margins using the results from the regressions performed in Table 21. Each column number corresponds to the specification number in Table 21. Fund growth is divided in the following bins: Bin 1: Less than 2.1%, Bin 2: 2.1% to 44.4%, Bin 3: 44.4% to 75.1%, Bin 4: 75.1% to 128.7%, Bin 5: More than 128.7%.

| Variables | (1)<br>Change Net IRR | (2)<br>Change Benchmarked Net IRR |
|---|---|---|
| Fund Growth Bin = 1 | -0.7713 | -0.3370 |
| | (2.132) | (2.060) |
| Fund Growth Bin = 2 | -2.1411 | -1.1097 |
| | (2.062) | (2.245) |
| Fund Growth Bin = 3 | 0.0834 | 0.9414 |
| | (1.844) | (1.854) |
| Fund Growth Bin = 4 | -2.6385 | -1.0175 |
| | (1.703) | (1.660) |
| Fund Growth Bin = 5 | -10.7060*** | -8.6577 |
| | (2.921) | (2.747) |
| Observations | 410 | 410 |
| Region Fixed Effects | Yes | Yes |
| Year fixed effects | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

# Appendix 17

**Table 23**

This table displays the results of OLS regressions, where only funds are included in the sample that have been investing for at least 8 years. The dependent variables are Change Net IRR and Change Benchmarked Net IRR. Change Net IRR and Change Benchmarked Net IRR is the percentage point difference in the Net IRR or Benchmarked Net IRR between two subsequent funds. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%. Fund Size is the realized fund size of a fund in millions of US dollars. Capital Inflow is the aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year and in millions of US dollars. Fund Sequence Firm is the fund sequence number of all funds raised by the firm.

| Variables | (1)<br>Change Net IRR | (2)<br>Change Benchmarked Net IRR |
|---|---|---|
| Fund Expected Growth Bin = 1 | 0.2646 | -0.1014 |
| | (6.399) | (6.039) |
| Fund Expected Growth Bin = 2 | 5.1007 | 5.8277 |
| | (3.635) | (3.626) |
| Fund Expected Growth Bin = 3 | 2.4952 | 1.3085 |
| | (3.171) | (3.036) |
| Fund Expected Growth Bin = 4 | 1.1590 | 1.3272 |
| | (3.189) | (3.069) |
| Fund Unexpected Growth Bin = 1 | 7.8813 | 7.2491 |
| | (5.014) | (4.840) |
| Fund Unexpected Growth Bin = 2 | 2.6998 | 2.1248 |
| | (3.613) | (3.492) |
| Fund Unexpected Growth Bin = 3 | 7.0056** | 6.0280* |
| | (3.483) | (3.463) |
| Fund Unexpected Growth Bin = 4 | 5.9655** | 5.7527** |
| | (2.844) | (2.771) |
| Log(Fund Size) | -0.7303 | -0.6255 |
| | (1.589) | (1.495) |
| VC Dummy | -25.1536** | -0.4022 |
| | (9.896) | (9.758) |
| Log(Capital Inflow) | -14.0337*** | -0.6746 |
| | (4.705) | (4.618) |
| Log(Firm Fund Number) | 4.8517** | 4.4988** |
| | (2.062) | (2.065) |
| Constant | 141.5476*** | 3.2629 |
| | (42.310) | (41.473) |
| Observations | 410 | 410 |
| R-squared | 0.269 | 0.147 |
| Region Fixed Effects | Yes | Yes |
| Year fixed effects | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

# Appendix 18

**Table 24**

This table displays the predictive margins using the results from the regressions performed in Table 23. Each column number corresponds to the specification number in Table 23. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%.

| Variables | (1)<br>Change Net IRR | (2)<br>Change Benchmarked Net IRR |
|---|---|---|
| Fund Expected Growth Bin = 1 | -5.1578 | -4.1731 |
| | (4.921) | (4.637) |
| Fund Expected Growth Bin = 2 | -0.3217 | 1.7560 |
| | (2.086) | (2.116) |
| Fund Expected Growth Bin = 3 | -2.9273 | -2.7632 |
| | (1.795) | (1.741) |
| Fund Expected Growth Bin = 4 | -4.2634* | -2.7445 |
| | (2.170) | (2.022) |
| Fund Expected Growth Bin = 5 | -5.4224** | -4.0717 |
| | (2.601) | (2.538) |
| Fund Unexpected Growth Bin = 1 | 0.4868 | 1.4454 |
| | (3.994) | (3.879) |
| Fund Unexpected Growth Bin = 2 | -4.6947** | -3.6789* |
| | (2.062) | (1.977) |
| Fund Unexpected Growth Bin = 3 | -0.3889 | 0.2243 |
| | (2.517) | (2.513) |
| Fund Unexpected Growth Bin = 4 | -1.4291 | -0.0511 |
| | (1.498) | (1.5462) |
| Fund Unexpected Growth Bin = 5 | -7.3945*** | -5.8037** |
| | (2.481) | (2.390) |
| Observations | 410 | 410 |
| Region Fixed Effects | Yes | Yes |
| Year fixed effects | Yes | Yes |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

# Appendix 19

**Table 25**

This table displays the results of OLS regressions, where the dependent variables are winsorized at 1% or 5%. The dependent variables are Change Net IRR and Change Benchmarked Net IRR. Change Net IRR and Change Benchmarked Net IRR is the percentage point difference in the Net IRR or Benchmarked Net IRR between two subsequent funds. Fund Growth is the growth rate between the realized fund size of a fund and the previous fund size of a fund within the same fund family. Fund growth is divided in the following bins: Bin 1: Less than 2.1%, Bin 2: 2.1% to 44.4%, Bin 3: 44.4% to 75.1%, Bin 4: 75.1% to 128.7%, Bin 5: More than 128.7%. Fund Size is the realized fund size of a fund in millions of USD. VC Dummy is a dummy variable equal to 1 if the fund is a VC fund and 0 if the fund is a Buyout fund. Capital Inflow is the aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year and in millions of USD. Fund Sequence Firm is the fund sequence number of all funds raised by the firm.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Change Net IRR | Change Benchmarked Net IRR | Change Net IRR | Change Benchmarked Net IRR |
| Variables | (winsorized at 1%) | (winsorized at 1%) | (winsorized at 5%) | (winsorized at 5%) |
| Fund Growth Bin = 1 | 5.4827** | 5.3897** | 4.7984** | 4.0544** |
| | (2.627) | (2.481) | (2.102) | (1.935) |
| Fund Growth Bin = 2 | 6.0980** | 6.1937*** | 4.7680** | 4.7124*** |
| | (2.461) | (2.289) | (1.845) | (1.667) |
| Fund Growth Bin = 3 | 5.8343** | 4.6647** | 2.8701 | 2.5949 |
| | (2.424) | (2.185) | (1.874) | (1.645) |
| Fund Growth Bin = 4 | 2.6860 | 2.7441 | 1.0229 | 2.9286* |
| | (2.275) | (2.058) | (1.765) | (1.509) |
| Log(Fund Size) | -0.3346 | -0.2395 | 0.1904 | 0.1304 |
| | (0.839) | (0.798) | (0.624) | (0.529) |
| VC Dummy | -14.0130* | -2.4555 | -17.4665*** | 4.0028 |
| | (7.355) | (6.439) | (5.056) | (4.777) |
| Log(Capital Inflow) | -9.2160*** | -1.3699 | -10.2364*** | 1.1899 |
| | (3.349) | (2.876) | (2.302) | (2.230) |
| Log(Fund Sequence Firm) | 1.7123 | 1.4449 | 0.8112 | 0.1761 |
| | (1.592) | (1.503) | (1.065) | (0.951) |
| Constant | 101.8384*** | 15.3967 | 107.5947*** | -6.2190 |
| | (30.979) | (26.829) | (22.289) | (20.508) |
| Observations | 581 | 579 | 536 | 540 |
| R-squared | 0.214 | 0.091 | 0.259 | 0.113 |
| Region Fixed Effects | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

# Appendix 20

**Table 26**

This table displays the predictive margins using the results from the regressions performed in Table 25. Each column number corresponds to the specification number in Table 25. Fund growth is divided in the following bins: Bin 1: Less than 2.1%, Bin 2: 2.1% to 44.4%, Bin 3: 44.4% to 75.1%, Bin 4: 75.1% to 128.7%, Bin 5: More than 128.7%.

| Variables | (1)<br>Change Net IRR<br>(winsorized at 1%) | (2)<br>Change Benchmarked Net IRR<br>(winsorized at 1%) | (3)<br>Change Net IRR<br>(winsorized at 5%) | (4)<br>Change Benchmarked Net IRR<br>(winsorized at 5%) |
|---|---|---|---|---|
| Fund Growth Bin = 1 | 0.9158 | 0.7187 | 1.3952 | 0.3720 |
| | (1.555) | (1.565) | (1.281) | (1.261) |
| Fund Growth Bin = 2 | 1.5311 | 1.5227 | 1.3648 | 1.0301 |
| | (1.478) | (1.406) | (0.987) | (0.957) |
| Fund Growth Bin = 3 | 1.2674 | -0.0063 | -.05331 | -1.0874 |
| | (1.494) | (1.335) | (1.143) | (1.059) |
| Fund Growth Bin = 4 | -1.8809 | -1.9270 | -2.3803** | -0.7538 |
| | (1.324) | (1.286) | (1.031) | (0.928) |
| Fund Growth Bin = 5 | -4.5669** | -4.6711*** | -3.4032** | -3.6823*** |
| | (1.882) | (1.688) | (1.463) | (1.267) |
| Observations | 581 | 579 | 536 | 540 |
| Region Fixed Effects | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

# Appendix 21

**Table 27**

This table displays the results of OLS regressions, where the dependent variables are winsorized at 1% or 5%. The dependent variables are Change Net IRR and Change Benchmarked Net IRR. Change Net IRR and Change Benchmarked Net IRR is the percentage point difference in the Net IRR or Benchmarked Net IRR between two subsequent funds. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%. Fund Size is the realized fund size of a fund in millions of US dollars. Capital Inflow is the aggregate inflow of capital into a particular fund type (Buyout or VC) measured per vintage year and in millions of US dollars. Fund Sequence Firm is the fund sequence number of all funds raised by the firm.

| Variables | (1) Change Net IRR (winsorized at 1%) | (2) Change Benchmarked Net IRR (winsorized at 1%) | (3) Change Net IRR (winsorized at 5%) | (4) Change Benchmarked Net IRR (winsorized at 5%) |
|---|---|---|---|---|
| Fund Expected Growth Bin = 1 | 2.7598 | 3.1558 | 4.5931** | 4.3169** |
| | (2.517) | (2.403) | (1.995) | (1.810) |
| Fund Expected Growth Bin = 2 | 4.0210 | 4.2050* | 4.0308** | 2.9788* |
| | (2.455) | (2.277) | (1.750) | (1.650) |
| Fund Expected Growth Bin = 3 | 1.9634 | 2.0051 | 2.6030 | 1.7854 |
| | (2.242) | (2.125) | (1.735) | (1.538) |
| Fund Expected Growth Bin = 4 | -0.3345 | 0.2517 | 0.4910 | 1.5554 |
| | (2.390) | (2.078) | (1.715) | (1.598) |
| Fund Unexpected Growth Bin = 1 | 3.6630 | 3.6507 | -0.2381 | -0.1182 |
| | (2.487) | (2.248) | (1.885) | (1.787) |
| Fund Unexpected Growth Bin = 2 | 1.6147 | -0.1692 | 1.3879 | 1.4374 |
| | (2.078) | (1.988) | (1.607) | (1.497) |
| Fund Unexpected Growth Bin = 3 | 3.6401 | 1.2717 | 0.7325 | -0.1018 |
| | (2.300) | (1.939) | (1.753) | (1.632) |
| Fund Unexpected Growth Bin = 4 | 3.4344** | 2.3087 | 1.4922 | 0.9531 |
| | (1.746) | (1.584) | (1.387) | (1.260) |
| Log(Fund Size) | -0.4876 | -0.3760 | -0.2657 | -0.2290 |
| | (0.850) | (0.810) | (0.665) | (0.532) |
| VC Dummy | -15.6365** | -3.5757 | -18.9253*** | 2.4770 |
| | (7.326) | (6.298) | (4.948) | (4.784) |
| Log(Capital Inflow) | -9.8052*** | -1.9273 | -10.6826*** | 0.7364 |
| | (3.347) | (2.816) | (2.248) | (2.223) |
| Log(Fund Sequence Firm) | 1.6659 | 1.6052 | 1.0197 | 0.4150 |
| | (1.588) | (1.515) | (1.041) | (0.939) |
| Constant | 108.1210*** | 22.0662 | 115.1150*** | -0.7228 |
| | (31.459) | (26.064) | (21.685) | (20.464) |
| Observations | 581 | 579 | 536 | 540 |
| R-squared | 0.215 | 0.092 | 0.263 | 0.114 |
| Region Fixed Effects | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

# Appendix 22

**Table 28**

This table displays the predictive margins using the results from the regressions performed in Table 27. Each column number corresponds to the specification number in Table 27. Fund Expected Growth is the percentage growth a fund expects from its previous fund. The bins of Fund Expected Growth are divided as follows: Bin 1: Less than 7%, Bin 2: 7% to 36%, Bin 3: 36% to 66.6%, Bin 4: 66.6% to 112.8%, Bin 5: More than 112.8%. Fund Unexpected Growth is calculated by subtracting the expected fund growth from the realized fund growth and is therefore also expressed as a percentage. The bins of Fund Unexpected Growth are divided as follows: Bin 1: Less than -25%, Bin -25% to -1%, Bin 3: -1% to 1%, Bin 4: 1% to 26.5%, Bin 5: More than 26.5%.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Change Net IRR | Change Benchmarked Net IRR | Change Net IRR | Change Benchmarked Net IRR |
| Variables | (winsorized at 1%) | (winsorized at 1%) | (winsorized at 5%) | (winsorized at 5%) |
| Fund Expected Growth Bin = 1 | 0.5622 | 0.3867 | 1.5268 | 1.3718 |
| | (1.575) | (1.499) | (1.320) | (1.175) |
| Fund Expected Growth Bin = 2 | 1.8235 | 1.4359 | 0.9644 | 0.0337 |
| | (1.491) | (1.405) | (1.001) | (0.996) |
| Fund Expected Growth Bin = 3 | -0.2341 | -0.7639 | -0.4633 | -1.1597 |
| | (1.315) | (1.331) | (1.068) | (0.935) |
| Fund Expected Growth Bin = 4 | -2.5320* | -2.5174* | -2.5753** | -1.3897 |
| | (1.461) | (1.282) | (1.100) | (1.086) |
| Fund Expected Growth Bin = 5 | -2.1975 | -2.7691* | -3.0663** | -2.9451** |
| | (1.823) | (1.653) | (1.342) | (1.219) |
| Fund Unexpected Growth Bin = 1 | 0.9277 | 1.4560 | -1.6314 | -1.3820 |
| | (2.005) | (1.874) | (1.431) | (1.451) |
| Fund Unexpected Growth Bin = 2 | -1.1205 | -2.3639 | -0.0053 | 0.1735 |
| | (1.613) | (1.610) | (1.229) | (1.122) |
| Fund Unexpected Growth Bin = 3 | 0.9048 | -0.9230 | -0.6607 | -1.3656 |
| | (1.849) | (1.553) | (1.398) | (1.329) |
| Fund Unexpected Growth Bin = 4 | 0.6991 | 0.1140 | 0.0990 | -0.3108 |
| | (1.248) | (1.202) | (0.929) | (0.875) |
| Fund Unexpected Growth Bin = 5 | -2.7353** | -2.1947** | -1.3932 | -1.2639 |
| | (1.273) | (1.099) | (1.022) | (0.904) |
| Observations | 581 | 579 | 536 | 540 |
| Region Fixed Effects | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1