MEKETA

INVESTMENT GROUP

Viewpoints

# Optimal Portfolio Size for Private Equity

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Our research found that the average number of funds invested in per year, as well as the overall allocation to private equity, are growing in recent years. In addition, there is no clear connection between the number of commitments each year and long-term private equity returns. As expected, the number of funds increases with pension plan size. However, this does not directly lead to higher or lower returns. We did find that investing in more funds per year results in lower return volatility. That is, diversification can mitigate the risk of experiencing substantially sub-par returns.

While plans with more GPs have generally performed better, we believe this is more likely the result of program size and maturity. We believe the number of GPs an investor chooses to partner with should be based on best practices and other factors that vary for each investor.

In this viewpoint, we seek to answer several questions that are important to investors who allocate capital to private equity. These questions are concentrated on the optimal approach to, and best practices for, constructing a private equity portfolio through time.

For example, is there an optimal number of funds to commit to in a given vintage year? Is there an ideal number of general partner ("GP") relationships to maintain through time? How many funds does a typical institutional investor allocate to? How does this affect portfolio performance?

To answer these questions, we analyzed data from Preqin as well as Annual Financial Reports for public pension funds.[1] Our analysis focused on institutional investors who primarily commit to individual funds rather than fund of funds.

[1] We conducted our analysis on this group of institutional investors because it has the most publicly available data.

## Number of funds by vintage year

Private equity investors typically invest in multiple funds for any one vintage year. The number of funds varies by year (often due to market conditions) as well as by the size of the investor. Figure 1 displays the average number of private equity funds invested in per vintage year, divided into three categories based on the size of the plan.[2]

[2] Small Size = $1 billion to $10 billion AUM as of 2021; Mid-Size = between $10 billion and $60 billion AUM as of 2021; Large Size = over $60 billion AUM as of 2021. See the appendix for a full explanation of our methodology.

For example, the number of fund investments dropped for each category of size pension plan in conjunction with the Global Financial Crisis (GFC), with the decrease in number being most prevalent for the 2009 and 2010 vintage years. It took roughly a decade for the number of commitments to return to their pre-GFC level.

The data showed that smaller pension plans typically invest in a low number of funds, averaging just one fund commitment per year. Mid-size pension plans tend to commit to five to seven funds per year, though this number has been gradually rising since the GFC. Large pension plans tend to hold the greatest number of investments, though they saw the sharpest drop-off in number of commitments during the GFC, as well as the steepest rebound afterward.

Large plans tend to hold more funds for a variety of practical reasons. First, they may include investments in other private market asset classes, such as private credit and natural resources, within their private equity portfolio. Second, they may seek exposure to some smaller funds for which there is limited access (e.g., in venture capital), so they must make commitments to a greater number of funds to get the desired exposure. Third, they may commit to more specialized funds (e.g., by sector or geography) that likewise require more diversification by fund.

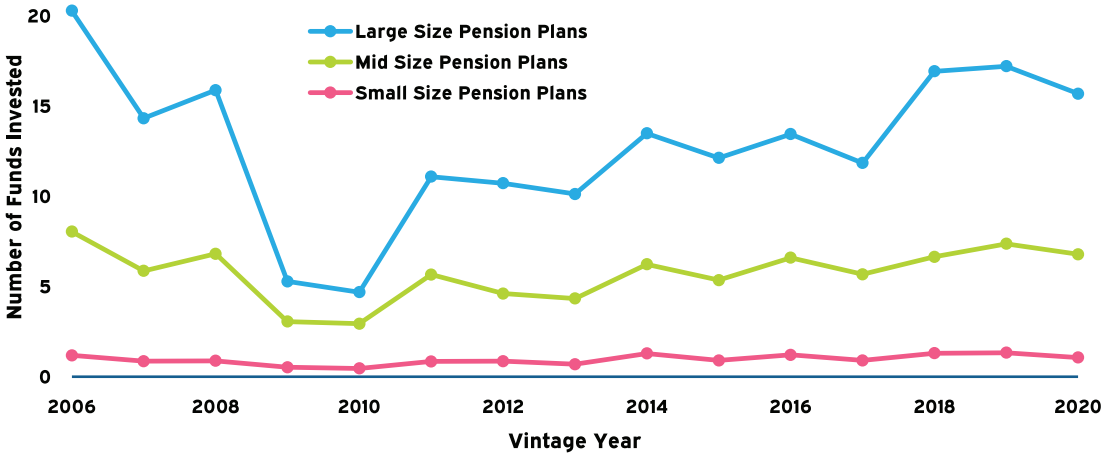



FIGURE 1

**Average Number of Private Equity Investments by Vintage Year**

Source: Preqin, Private Equity Funds Invested in by Vintage Year, 2006 to 2020, as of Q4 2021, excludes fund of funds.

## The relationship between number of funds and performance

A natural question to ask is whether there is a link between the number of funds in which a plan invests and the performance of their private equity program. It could be theorized that investing in a larger number of funds entails investing in "lower conviction" funds or an inability to generate economies of scale. Conversely, investing in a smaller number of funds is more likely to lead to a wider dispersion of possible outcomes, especially relative to what the investor anticipated for the private equity program.

Figure 2 plots each plan's 10-year annualized returns for their private equity portfolio and their average number of private equity funds invested in per vintage year (over the past 10 years).

Across all size pension plans, the average 10-year annualized return is 12.0%, while the average number of funds per year is 4.6. The results of this comparison suggest that there is no clear link between the number of funds and performance. While there is an ever-so-slight upward trend (with returns trending upwards as the number of funds increases), it is statistically insignificant (note the R2 of 0.05).

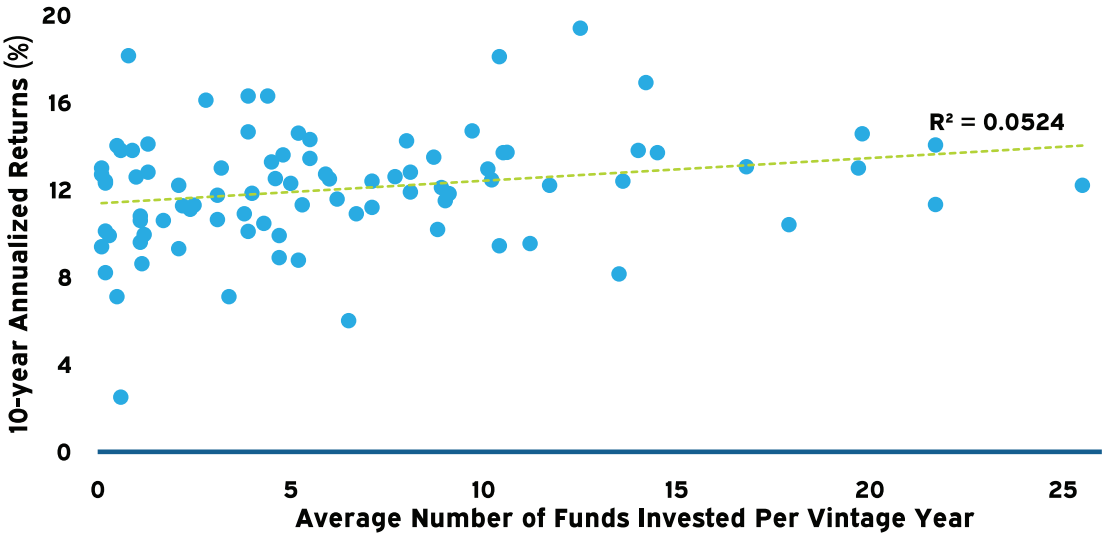



FIGURE 2

**Average Number of Funds per Vintage Year vs 10-Year Annualized Returns**

Source: Preqin and Meketa review of 2020 annual financial reports of public pension plans. Data reflects 10-year annualized time-weighted returns. Note that 10-year performance was not available for all of the plans. Private Equity Funds Invested is for vintage years 2006 to 2020, as of 4Q 2021, and excludes fund of funds.

Perhaps unsurprisingly, as the number of funds increases in Figure 2, the dispersion of performance from the mean decreases (i.e., returns tend to cluster closer around the average for plans with more funds). Hence, there appears to be a diversification benefit as these plans experience less return volatility as more funds are invested in per year.

This diversification benefit is evident in Figure 3, which depicts the spread of returns within each category of funds invested in per vintage year. The lower categories of one through five funds per year exhibit higher dispersion of returns. Starting in the six to seven fund range, dispersion decreases overall. In the categories of 6-7, 8-10, and 16+ funds, dispersion is low and returns are more centralized. The 11-15 category has slightly more return dispersion than the other high-fund categories, though not enough to change the overall trend that more funds results in lower return variation.

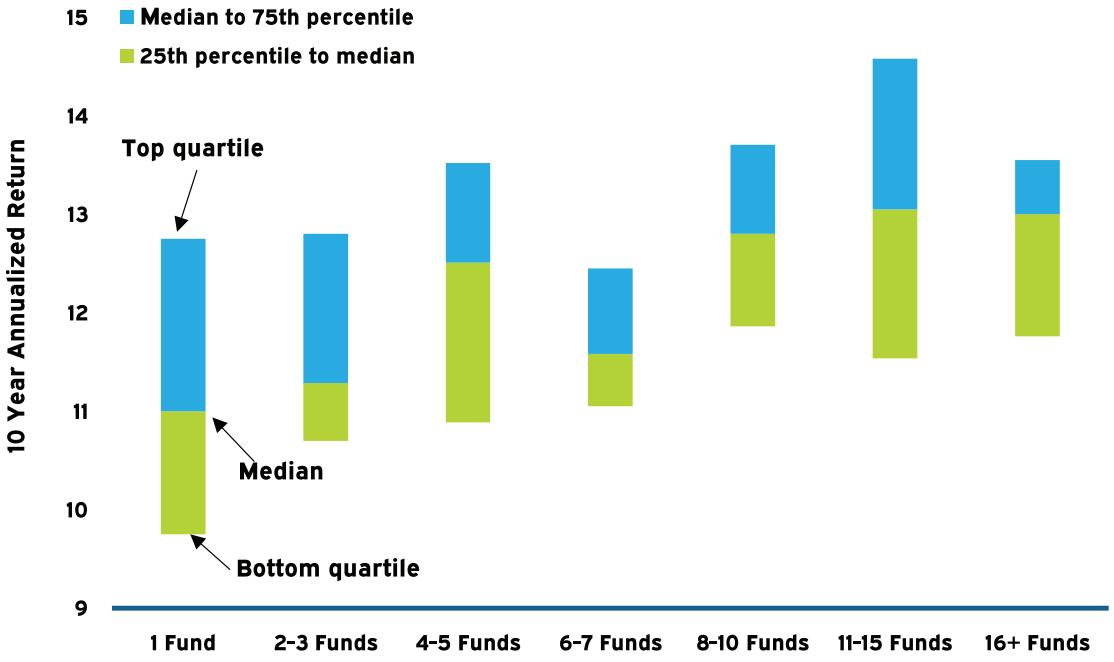



FIGURE 3

**Return Dispersion Categorized by Number of Funds**

Source: Preqin and Meketa review of 2020 annual financial reports of public pension plans. Data reflects 10-year annualized time-weighted returns. Note that 10-year performance was not available for all of the plans. Private Equity Funds Invested is for vintage years 2006 to 2020, as of 4Q 2021, and excludes fund of funds.

Note:Refer to the Appendix for a description of the sample size of each bucket.

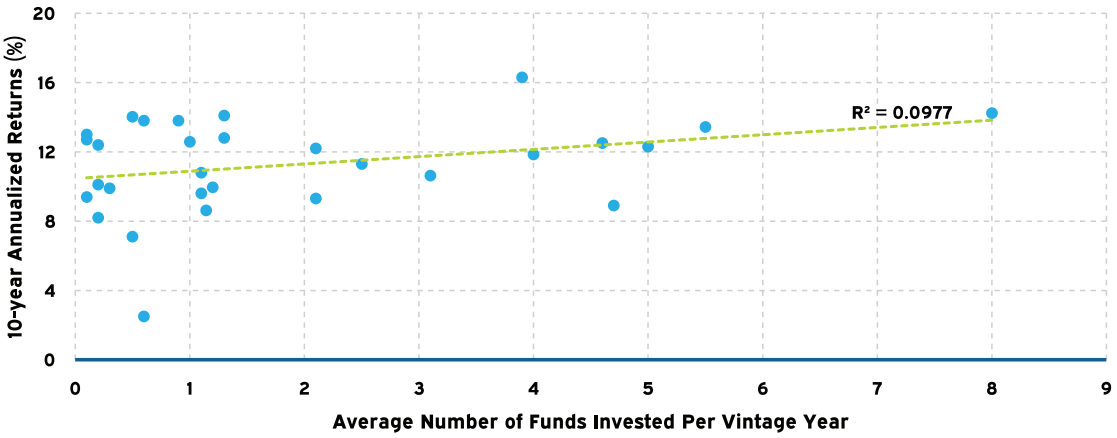
## Breakdown by plan size

The three graphs below are a breakdown by pension plan size (AUM) that plots each plan's 10-year annualized returns for their private equity portfolio and their average number of private equity funds invested in per vintage year (over the past 10 years). Differences can be seen in the average number of funds invested in per year.

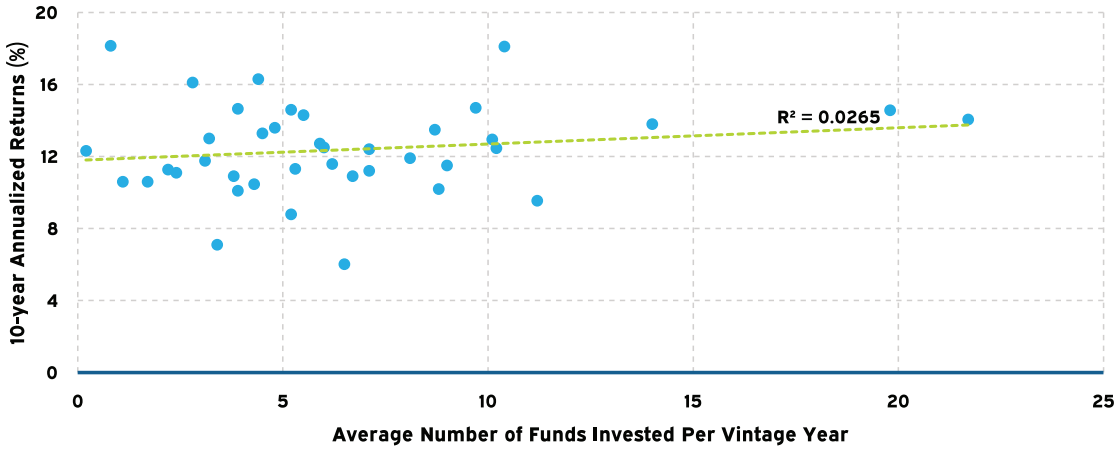
The number of funds invested in by large plans ranged from five to 25 funds per vintage year, with a fairly even dispersion within that range. In contrast, the range for smaller plans was between zero and eight funds per year, though it was much more concentrated around the lower end of the range.

However, there is no clear distinction between the returns of the three pension plan sizes. In all three graphs, returns are centered between 10% and 15%. This means that high (or low) returns are not inherent to a specific plan size.

### Small size




### Mid size




### Large size

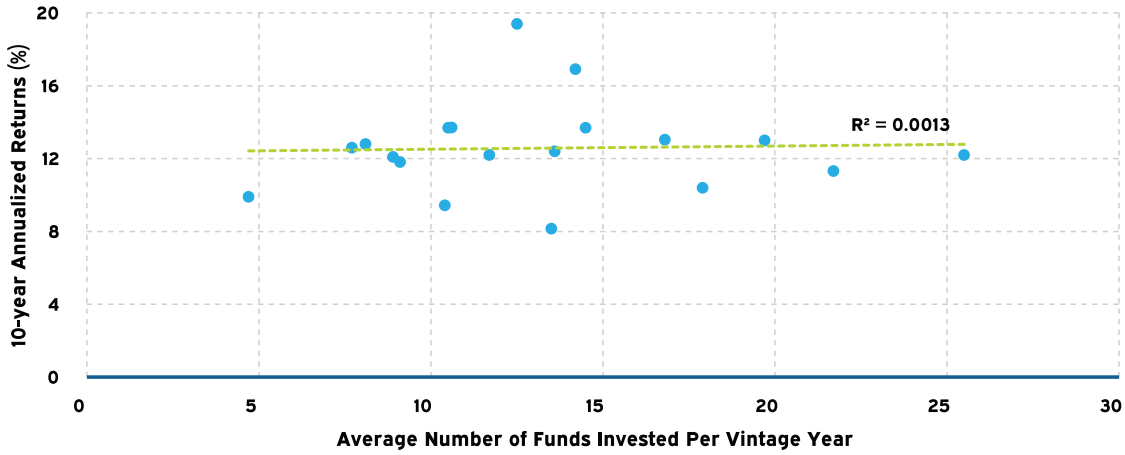



FIGURE 4

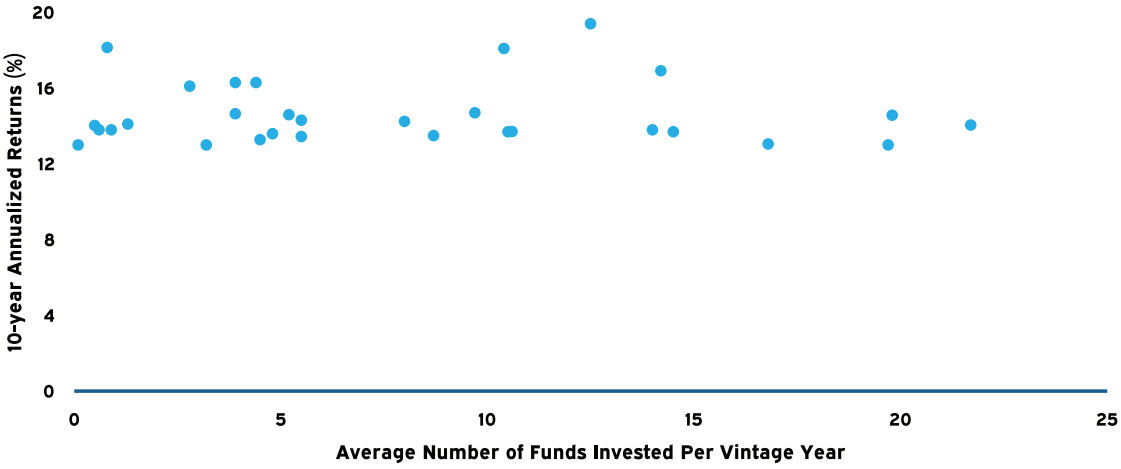
**Average Funds Invested Per Year vs 10-Year Returns**

Source: Preqin and Meketa review of 2020 annual financial reports of public pension plans. Data reflects 10-year annualized time-weighted returns. Note that 10-year performance was not available for all of the plans. Private Equity Funds Invested is for vintage years 2006 to 2020, as of 4Q 2021, and excludes fund of funds.

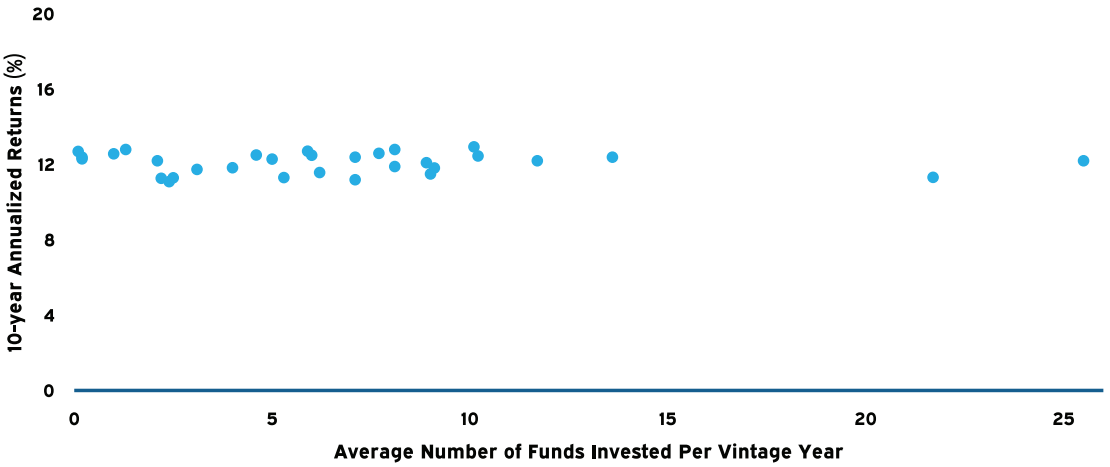
## Breakdown by plan size

The graphs below take that same data for all plans, but instead of looking at it in aggregate, they display the data by tiered performance, as divided into three tiers of returns.

### Top tier (over 13% 10-year annualized return)




### Middle tier (11% to 13% 10-year annualized return)




### Bottom tier (under 11% 10-year annualized return)

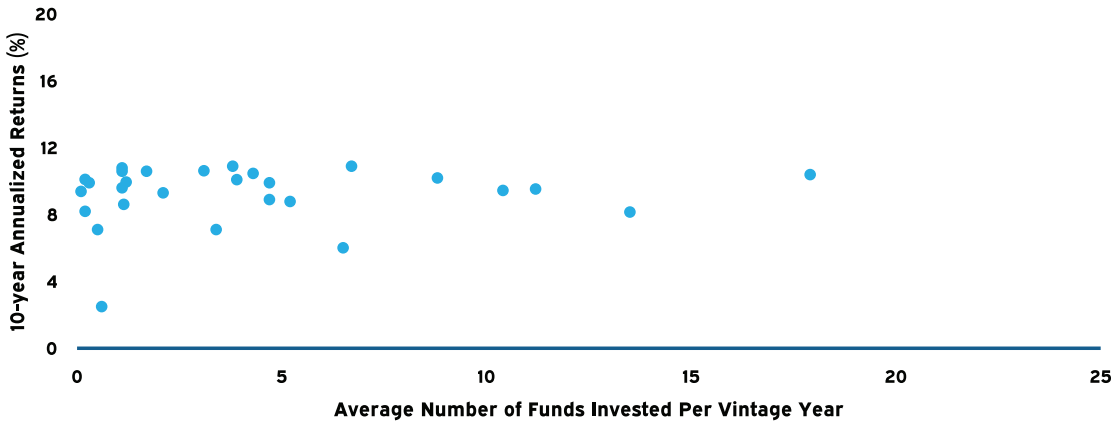



FIGURE 5

**Average Number of Funds Invested Per Vintage Year 10-Year Annualized Return**

Source: Preqin and Meketa review of 2020 annual financial reports of public pension plans. Data reflects 10-year annualized time-weighted returns. Note that 10-year performance was not available for all of the plans. Private Equity Funds Invested is for vintage years 2006 to 2020, as of 4Q 2021, and excludes fund of funds.

The horizontal uniformity of each graph implies that there is no definitive optimal number of funds to invest in per year.

However, there are some trends that are worth noting. First, the top tier performers have the highest average number of funds (at eight), and the bottom tier performers have the lowest average (at three). While the top tier has the highest average number of funds, it also exhibits the widest dispersion of the number of funds (with a standard deviation of six). Moreover, as it includes the lowest and highest number of funds, along with a broad sampling of everything in between, it shows that investing in any number of funds per year has the potential to produce high returns. Conversely, it should not be inferred that investing in eight funds per year will result in top tier returns; rather, this number is only the average of a wide data range.

The bottom tier has the smallest standard deviation of funds and is heavily clustered below five funds. This implies that, while diversification does not necessarily lead to higher performance, it can mitigate the risk of experiencing substantially sub-par returns.

## Variation

Variation and return spreads are also important when analyzing the optimal portfolio in private equity.

As the number of private equity funds in a portfolio increases, the overall portfolio's return variation decreases. Correspondingly, the more funds in a portfolio, the less risky the portfolio generally, is, and the less variation there will be in returns. Investing in a larger number of funds tends to have less dispersion of outcomes compared to investing in a smaller number of primary funds. The benefit of decreased variation comes with the downside of increased complexity and costs for each additional fund.[3]

As shown in Figure 6, 10-year annualized private equity returns have less variation as AUM increases.[4] Mid-size pension plans have the benefit of more available funding than small size pensions; therefore, they can invest in a higher number of funds, allowing for investments in specialized funds and greater opportunity for increased returns. Large size pension plans have the largest budgets and tend to invest in more funds than both medium and small size plans. Thus, large size pension plans have the

[3] Source: "Risk in Private Equity" research paper published in October 2015. Dr. Christian Diller, Dr. Christoph Jackel, and Montana Capital Partners.

[4] Source: "Risk in Private Equity" research paper published in October 2015. Dr. Christian Diller, Dr. Christoph Jackel, and Montana Capital Partners.

smallest variation spread. While asset size and number of fund investments are not indicative of returns, they do contribute to return variation spreads.

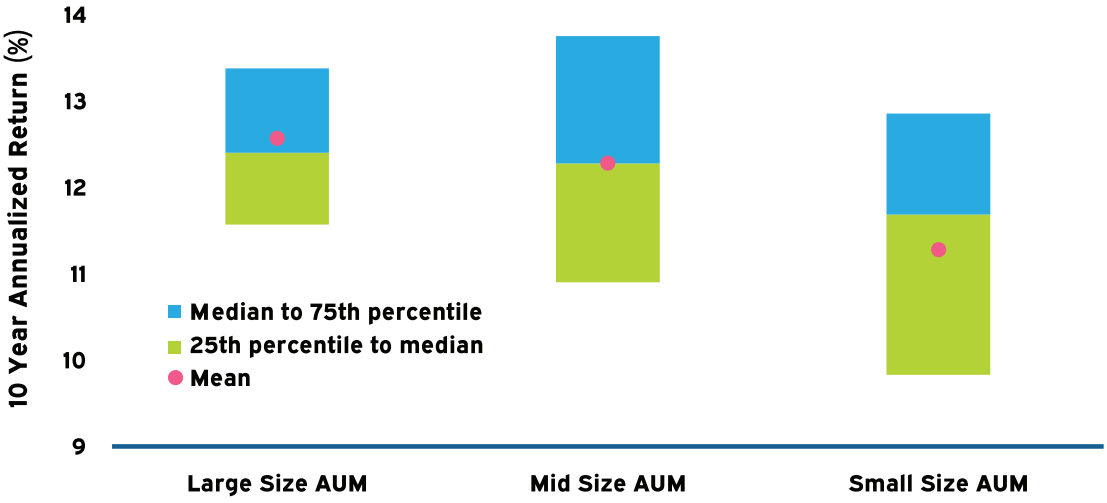



FIGURE 6

**Dispersion of Public Pension Plans: 10-Year Annualized Return**

Source: "Risk in Private Equity" research paper published in October 2015. Dr. Christian Diller, Dr. Christoph Jackel, and Montana Capital Partners.

## GPs per plan

The number of GPs within each public pension plan is also an important factor when crafting the optimal portfolio. There are tradeoffs when considering more versus fewer GPs, and these tradeoffs resemble those for the number of underlying funds. For example, more GPs allow for higher rates of diversification and exposure, but too many GPs may dilute the potential for alpha generation as it is more costly from a legal and accounting perspective. Limiting the number of GPs also has its benefits as it enables investors and GPs to establish trusted relationships and is easier for staff and the consultant to conduct oversight.

Re-ups[5] are a common practice, as they allow a portfolio to maintain or increase their allocation to private equity without increasing the number of GPs. Based on our experience, we estimate that LPs re-up with 50% to 70% of their GPs from one fund to the next.

[5] Re-ups are when a portfolio invests in another fund with the same GP with whom they previously invested.

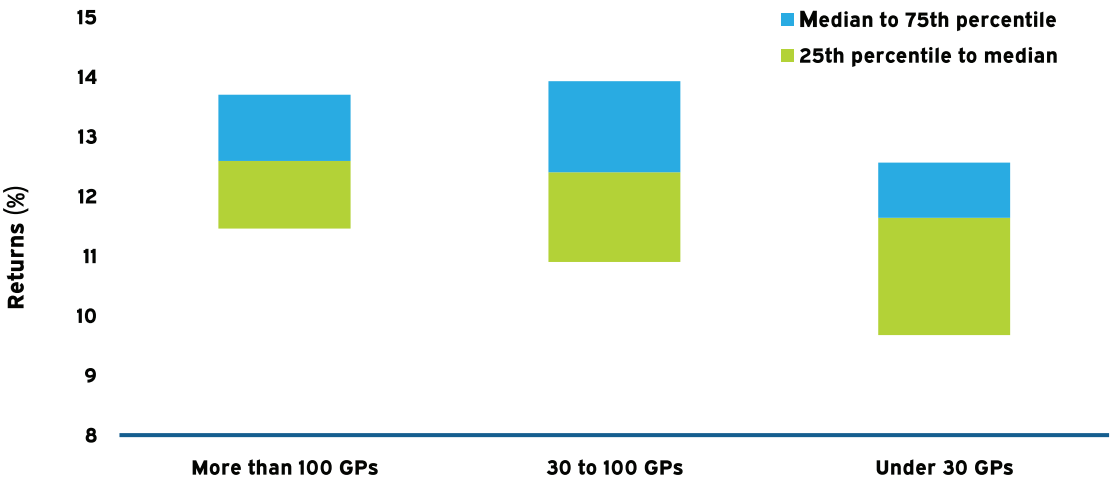



FIGURE 7

**10-Year Private Equity Returns by the Number of GPs per Pension Plan**

Source: Preqin, Fund Manager Relationships, only managers with listed funds are counted (present and historical), as of Q4 2021. Note: This data is only available as a total count of the number of GPs that currently have or have previously had funds with the pension plan. As a result, fund counts may be higher than the current number of GPs in a pension plan.

Figure 7 shows the mean, top and bottom quartile returns over a 10-year horizon, broken out by the number of GPs in the investor's portfolio. It appears that investors with larger numbers of GPs have performed slightly better. This can be inferred from higher numbers across the board for the top and bottom quartiles and for the mean, with one exception,[6] as the number of GPs increases. However, this might have more to do with other factors that are not obvious from this table.

[6] The top 25th percentile return is highest for the middle group (30 to 100 GPs), though this group also has much more return variation than the group with the most GPs.

For example, plans with more GPs are likely to be larger and, hence, may have better success at negotiating better terms (e.g., lower fees), have access to lower cost vehicles (e.g., separate accounts) that are not available to smaller plans, and are less reliant on vehicles like fund of funds that charge an additional layer of fees. Similarly, plans with greater numbers of GPs are often more likely to have mature private equity programs, whereas plans with fewer GPs are often more likely to have newer programs, and hence their returns may be impacted by the J-curve effect.

Given that it is difficult to separate these factors, we are unable to draw any conclusions about a distinct, optimal number of GPs to have in a portfolio.

### Meketa's optimal portfolio theory

In 2016, Meketa conducted an internal study that examined the number of funds in a private equity portfolio and the corresponding risk associated with the various numbers of funds.

Our analysis found that too few funds (e.g., less than five funds per year) increased volatility by an amount that was not optimal. For clients seeking relatively concentrated portfolios, we found that targeting seven to eight private equity commitments per year struck a good balance between diversification and concentration. Still, investors should be aware that there are best practices to consider when determining the ideal approach for their private equity program. The following table summarizes some of the benefits and challenges of running a concentrated private equity portfolio.

| Benefits of Portfolio Concentration | Challenges of Portfolio Concentration |
|---|---|
| → Potential to increase exposure to the highest conviction investments<br>→ Deeper relationships with GPs, potentially leading to:<br>• Increased access to an oversubscribed fund<br>• Beneficial fee structures via larger commitments with scaling<br>• Beneficial arrangements with co-investing, which also reduces fees and permits some tailoring of portfolios<br>• Information sharing about the industry and markets<br>• Reduced complexity/cost of the program's operations:<br>• Less due diligence, monitoring, and reporting<br>• Less cost (legal, staff)<br>• Less headline risk<br>Focusing on a limited number of strategies/ managers can have the benefit of knowing them well, which may reduce the risk of surprises in terms of strategy drift, cultural drift, and headline risk | → Limited ability to use targeted, specialized funds (e.g., industry sector- or geography-focused)<br>• Specialized managers tend to have advantages that allow them to outperform general strategies<br>→ Smaller pool to choose from, primary funds must be generalized which eliminates specialized investment options<br>→ Limited access as only a very few funds can be chosen<br>→ Hard to implement for larger investors who have bigger commitment budgets<br>→ Potential to be more heavily impacted by one poor performer |

FIGURE 8

**Benefits and Challenges of Portfolio Concentration**

Source: Meketa Investment Group, 2022.

## Conclusions

The number of private equity funds Invested in per vintage year has been growing over the past 10 years, across all size pension plans. Fund investment levels have almost made a full recovery back to their pre-GFC highs of 2006.

Our analysis finds no clear connection between the average number of private equity funds invested in pension plans per year and long-term private equity returns. As expected, the number of funds typically increases with plan size. However, this does not directly lead to higher or lower returns; returns within each plan size are still widely dispersed. The data does not point to an optimal number of funds to invest in every year that inherently leads to higher returns.

However, there is a relationship between the average number of funds invested in per vintage year and the variation of returns. Specifically, investing in more funds per year logically results in lower return volatility. While diversification does not necessarily lead to higher performance, it can mitigate the risk of experiencing substantially sub-par returns.

We believe the performance data on the number of GPs is inconclusive. While plans with more GPs have generally performed better, we believe this is more likely the result of program size and maturity and the benefits those provide. Hence, we believe the number of GPs an investor chooses to partner with should be based on other factors (e.g., best practices) that vary for each investor. These factors should be taken into consideration when working with your advisor to construct an optimal portfolio.

Based on our findings, Meketa expects to continue to target seven to eight investments per year with concentrated discretionary private equity portfolios. We believe this number permits an appropriate amount of GP and fund diversification while still allowing our clients to seek strong returns over the long term.

## Appendix

### Benchmark private equity returns

The spread of private equity benchmark returns per year gives a snapshot of the industry over the past 10 years. In recent years, returns appear to be higher and have a higher dispersion than in earlier years. There are several factors contributing to this trend.

The first factor is the nature of private equity funds. Newer funds (i.e., those established in recent years) tend to only have a few underlying investments. For example, the average buyout fund might ultimately own 12 companies and purchase them gradually over a 5-year span. Thus, a fund that is only one year into its investment period many only be composed of two or three companies. Therefore, the returns of these newer, more concentrated funds may be more volatile, and there will likely be greater dispersion among these funds.

The second potential factor is the increasing popularity of private equity. Many types of investors, including pension plans, are allocating more to the private equity asset class. A common explanation is that investors are committing more to private equity to make up for the lower returns being experienced by many other asset classes. This greater amount of capital "chasing" private equity assets could be pushing up returns of existing portfolios.

Another possible factor behind higher recent returns is more broadly market related, not just specific to private equity. Namely, certain sectors of the economy (e.g., technology) that happen to be well represented in private equity (and especially venture capital) have performed well in recent years. Anecdotal evidence suggests that funds raised in the most recent vintage years have greater exposure to these sectors and hence have often posted strong returns.

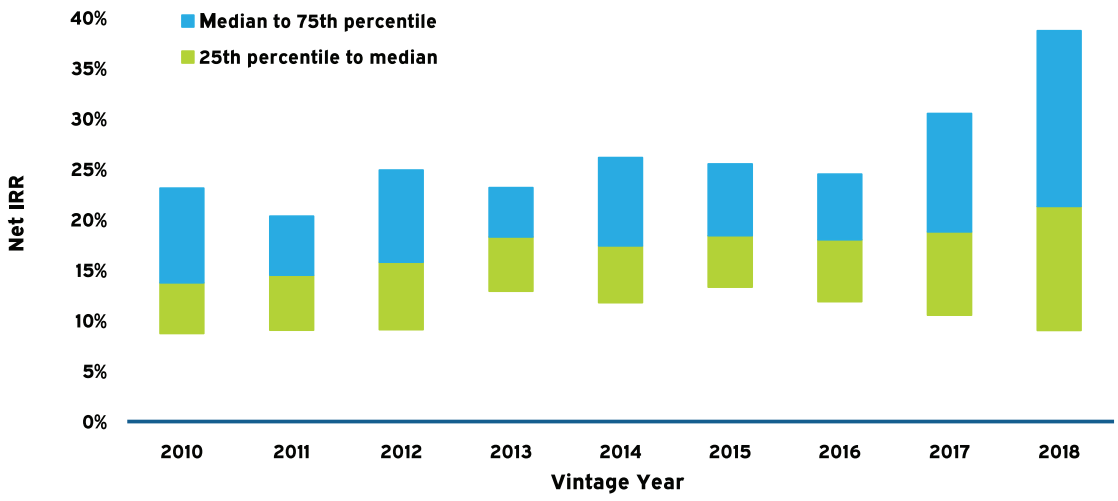



FIGURE 9

**Benchmark Private Equity Net IRR Percentile Returns**

Source: Preqin, Private Equity, Net IRR by Vintage Year, as of Q3 2021.

## Data and methodology notes

### Number of funds per vintage year

- Sourced from Preqin as of Q4 2021
- Vintage years range from 2006 to 2020 (2021 not used because data was incomplete at the time of our analysis)
- Fund of funds are not included in the funds per vintage year count
- Separate accounts and funds of one are included
- Small size = $1 billion to $10 billion AUM as of 2021
- Mid size = between $10 billion and $60 billion AUM as of 2021
- Large size = over $60 billion AUM as of 2021

### 10-year annualized returns

- Data sourced from individual public pension plans' 2020 annual financial reports
- Only 10-year annualized returns included
- Excludes broader categories such as alternate assets and combined PE/PD
- Excludes "predicted" 10-year returns

### List of public pension plans used

- List compiled from Pensions & Investments 2021 Top US Public Pension Plans
- Only includes public pension plans over $1 billion AUM
- Only those that plans that provided 10-year returns in their 2020 annual financial reports were used

### Bucket sample size for return dispersion

Sample sizes for each of the fund buckets are as follows:

- >15 funds = 7 sample size
- 11-15 funds = 8 sample size
- 8-10 funds = 15 sample size
- 6-7 funds = 7 sample size
- 4-5 funds = 15 sample size

### Number of GPs

- Sourced from Preqin as of Q4 2021
- Data is a total count of the number of GPs that currently have or have previously had funds with the pension plan
- Data includes GPs that public pension plans are listed to have funds invested in.
    - If a GP is listed on Preqin but the pension plan has no funds listed as invested in, they are excluded.

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