INSTITUTIONAL ADVISORY & SOLUTIONS

MEASURING THE VALUE OF LP FUND-SELECTION SKILL

A Fair Comparison Framework

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An LP must make many choices when investing in private markets: How to invest uncalled capital? How many funds to invest in each vintage? How to pace commitments? Is there a class of funds where skill matters more than others? We answer these questions using our fair comparison framework, which also allows a comparison across public and private assets.

We find that a careful selection of choices such as the default investment for uncalled and uncommitted capital, the level of diversification across both funds and vintages, and of course the choice of private market strategy (e.g., buyout, venture, or real estate) has a meaningful impact on the risk-adjusted returns of a private asset portfolio.

While fund-selection skill improved private asset performance, the benefit from skill was uneven across the different private markets. Somewhat counterintuitively, venture funds' (especially early stage) risk-adjusted performance may not improve the most from LP fund-selection skill. While mean returns improved, volatility persisted. Based on a fair comparison, we find that LPs may benefit the most from the skillful identification of good performing mezzanine and real estate funds. We also find that venture investments had the lowest risk-adjusted returns because of their high underlying risk, but they may still offer a better investment opportunity than public markets (manager alpha included), with or without skill.

We recently introduced a framework to compare the performance of illiquid private and liquid public assets on a fair basis (Jeet, 2019). Figure 1 provides a summary.[1] Our fair comparison framework reveals a different picture than what is typically reported and should be helpful to CIOs as they consider their asset allocation decisions.

Our findings were conditional on various assumptions: 1) the horizon period; 2) the number of fund commitments per vintage; 3) buyout funds only; 4) uncalled capital invested in the S&P 500; and 5) a 50% commitment pacing strategy that specifies the percentage of uncommitted capital committed to each new vintage. We now examine the sensitivity of our findings to these settings.

Our findings also assumed that the LP investor had no fund-selection skill – in other words, the LP simply picks funds at random. In practice, however, an LP's fund-selection skill likely has a meaningful impact on the risk and return profile of their private capital portfolio. In fact, Lerner, *et al.* (2007) found that *experience, sophistication,* and *access* – attributes commonly associated with LP skill – are among the top factors that cause a wide variation in the returns that institutional investors realize from private equity.[2]

1 Figure 1 is a simplified version of Figure 12 in Jeet (2019).
2 Another important factor is the objective of investing in private markets, which may be either diversification or seeking long-term opportunities.

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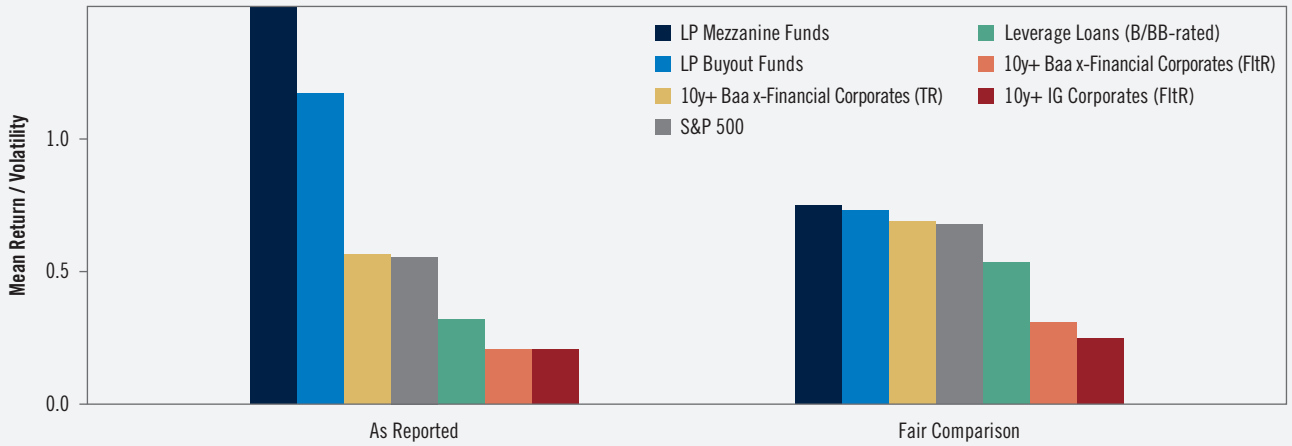
We seek to measure how much LP fund-selection skill matters to portfolio performance. Is fund-selection skill more important for some private market strategies than others? Also, is fund-selection skill more important in private markets than in public markets?

Figure 1: Comparison of Various Public and Private Investments: January 2005 to December 2018



Source: PGIM IAS, Burgiss, Bloomberg, S&P and Barclays. Provided for illustrative purposes only.

Base Case Assumptions

To facilitate our sensitivity analysis, we define a set of Base Case assumptions (Figure 2) which match those in Jeet (2019) except that we expand the investment horizon from 2005–2018 to 2000–2018.

Figure 2: Base Case Assumptions

Choice / Setting	Value
Skill Type	No Skill
Private Market Strategy	US Buyout Funds
Number of Commitments per Vintage	Five Funds (equally weighted)
Default Investment	S&P 500
Commitment Strategy	Commit 50% of Uncommitted Capital to Every Vintage
Investment Horizon	January 2000 to December 2018

Source: PGIM IAS. Provided for illustrative purposes only.

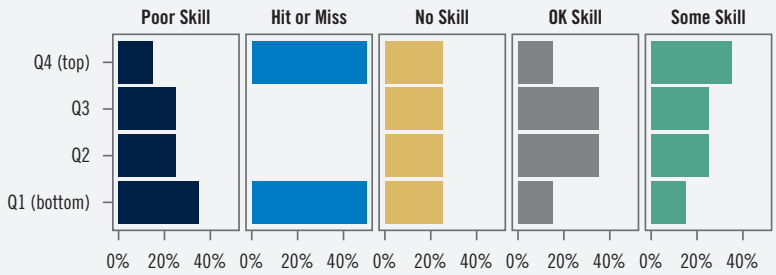
Sensitivity of Fund-Selection Skill vs. Base Case

To define LP fund-selection skill we divide funds of a given vintage into quartiles based on their subsequent since-inception TVPI performance. We define an LP's fund-selection skill by their fund-selection probabilities, by quartile.[3] A skilled LP will have a higher probability of selecting from better quartiles compared to a less-skilled LP. We present five representative skill types along with their associated selection probability distributions (Figure 3). Other skill types can be also considered.

3 Quartiles are defined at the time of commitment. For example, suppose there are 40 funds in a new vintage. We sort them using their ex post since-inception TVPI and form quartiles with 10 funds each. Ties are broken randomly.

Figure 3: Fund-Selection Skill: Selection Probability Distribution over Quartiles

Skill Type	Probability Distribution over Fund Quartiles
"Poor"	0.35, 0.25, 0.25, 0.15
"Hit or Miss"	0.50, 0.00, 0.00, 0.50
"No Skill"	0.25, 0.25, 0.25, 0.25
"OK"	0.15, 0.35, 0.35, 0.15
"Some"	0.15, 0.25, 0.25, 0.35

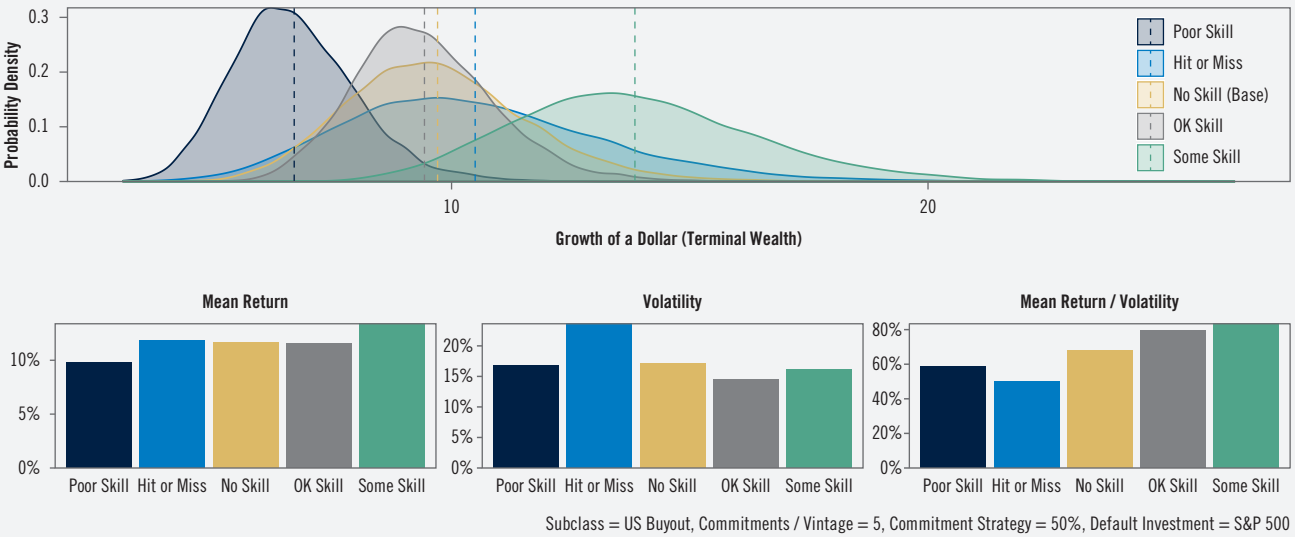


Source: PGIM IAS. Provided for illustrative purposes only.

- **Poor:** The LP selects funds from the lowest quartile with a 35% probability, a 25% probability from the third quartile, 25% from the second and 15% from the best. In other words, the LP is more likely to select funds from the bottom quartile and less likely from the top.
- **Hit or Miss:** The LP selects from either the top or bottom quartile, with equal probability.
- **No Skill:** The LP selects funds from any quartile with equal probability.
- **OK:** The LP tends to avoid both top and bottom quartile funds.
- **Some:** The LP has a high probability of selecting from the better quartiles and is likely to avoid bottom quartile funds.

Figure 4 provides a comparison of terminal wealth, by LP selection skill type, resulting from investing in a *self-contained, self-financed portfolio* of US buyout funds.[4] In terms of mean returns, Poor and Some Skill types are clearly different, as we might expect. However, mean returns for Hit or Miss, No Skill, and OK Skill types are indistinguishable. In terms of volatility, the skill types are quite different

Figure 4: Sensitivity to Fund-Selection Skill vs. Base Case: Buyout Funds



Subclass = US Buyout, Commitments / Vintage = 5, Commitment Strategy = 50%, Default Investment = S&P 500

Source: PGIM IAS, Burgiss. Provided for illustrative purposes only.

4 A self-contained private portfolio starts with a dollar of capital and commits a fraction of available capital to every vintage. Any committed capital waiting to be called is invested in the default investment. Any uncommitted capital is also held in the default investment. To meet a capital call a portion of the balance in the default investment is sold and distributions are re-invested. Capital does not flow in or out of the portfolio. At the end of investment horizon, the total wealth is the sum of private asset and default investment values. Depending on the choice of the default investment and commitment strategy, such a portfolio may have to short the default investment to meet a capital call. See Jeet (2019).

as Hit or Miss is much worse than No Skill and OK Skill. Consequently, risk-adjusted returns (*i.e.*, returns per unit of risk) are better for an LP with No Skill than for a Poor or a Hit-or-Miss LP skill type.

Some Skill or OK Skill are the best skill types in terms of the risk-adjusted returns. Having skill helps improve mean returns (compared to No Skill) while keeping volatility low.

We now explore the interaction of skill, private market strategies, and the other portfolio construction choices a private market investor must make.

Sensitivity of Default Investment Choice vs. Base Case

In private markets, making a capital "commitment" does not mean that the capital is "invested." After making a commitment, capital is called over the course of several years with an uncertain schedule. Some capital may also be returned during this time, again with an uncertain schedule. While waiting for capital calls, investors must invest uncalled capital in what we call a "default investment." In order to avoid liquidity issues, an investor may select a low-risk, low-return investment but this may dilute expected returns.[5] However, keeping uncalled capital in a high-risk, high-return default investment may result in a liquidity shortage when the capital is called.[6] The investor's choice of the default investment is an important decision.

We examine how the default investment choice affects private market performance by comparing two possible choices: S&P 500 and 3m LIBOR (3mL). Figure 4 compares the distribution of terminal wealth (starting with a dollar) and the estimated mean, volatility, and risk-adjusted returns. Figure 5 shows that the S&P 500 has been a better default investment choice compared to 3mL. Choosing 3mL not only reduced the mean return but also produced slightly higher volatility perhaps because the first half of 2000-2018 (also crucial for a self-contained private portfolio) was also a high-volatility period for 3mL. Average annual risk-adjusted returns with 3mL was only 0.6/y, compared to 0.7/y with S&P 500.

Over the investment horizon of 2000-2018, a dollar invested in 3mL and S&P 500 would have yielded $1.5 and $2.5 respectively, which makes the stock market a better choice over 3mL. But when these returns are adjusted for their underlying risk, 3mL turns out to be a much better opportunity. However, the timing of returns and their impact of the commitment pattern that ensued is yet another story. S&P 500, when used as the default investment, delivered extra 10bp/year risk-adjusted returns.

The relative performance reduction from 3mL is likely independent of the other assumptions (*e.g.*, the number of commitments and commitment strategy).

Sensitivity of Commitment Strategy vs. Base Case

Private assets are self-liquidating – with an uncertain schedule. Consequently, private asset investors must work to actively build and maintain a desired level of private market exposure (*i.e.*, NAV). An effective commitment pacing strategy is a key ingredient to this effort. In addition, investors tend to choose a commitment strategy that balances their preferences for liquidity and fund diversification over time which, in turn, may affect risk-adjusted returns.[7]

We consider a strategy that commits a fraction of uncommitted capital every vintage.[8] Uncommitted capital, together with uncalled capital, stays invested in the default investment (for this analysis, the S&P 500). We compare three commitment strategies of increasing aggressiveness: 50% (base case), 75%, and 100%. The choice of commitment strategy also affects the volatility of returns. A more aggressive commitment plan results in sporadic commitments and resulting cash flows, which, in turn, results in larger changes (from capital calls and distributions) in the default investment portfolio – producing more portfolio volatility.

Figure 6 shows that committing 50% of uncommitted capital produced the best risk-adjusted returns over the past 19y. While the 75% strategy was able to slightly improve mean returns, it also increased volatility producing lower risk-adjusted returns compared to the 50% commitment plan. The 50% plan was the best of the three choices considered. Note that the impact of the commitment strategy on performance is independent of other choices like private market strategy (such as buyout, venture, or real estate), number of commitments per vintage, default investment, and skill type.

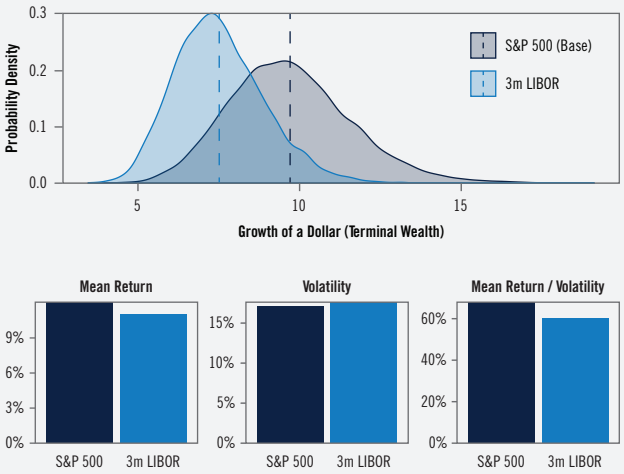
5 We do not explicitly address the issue of liquidity risk. By the term "liquidity issue" we mean not having enough capital to meet a capital call. One way to avoid this situation is to keep the uncalled capital in a low-risk and low-return investment vehicle. See Shen, et al. (2019) for an explicit tradeoff between performance and liquidity.

6 O'Shea and Jeet (2018) note this in their analysis of historical cash flows covering dot-com crisis of 2002 and global financial crisis of 2008 that GPs may continue to call committed capital when public markets are performing poorly either for existing or new deals arising out of market conditions. They also note that distributions are rare during crises. Their analysis, however, is largely circumstantial. Modeling and predicting cash flows during crisis is a much bigger challenge as the data cover only two crises.

7 See Shen, et al. (2020) for details relating to the choice of commitment strategy.

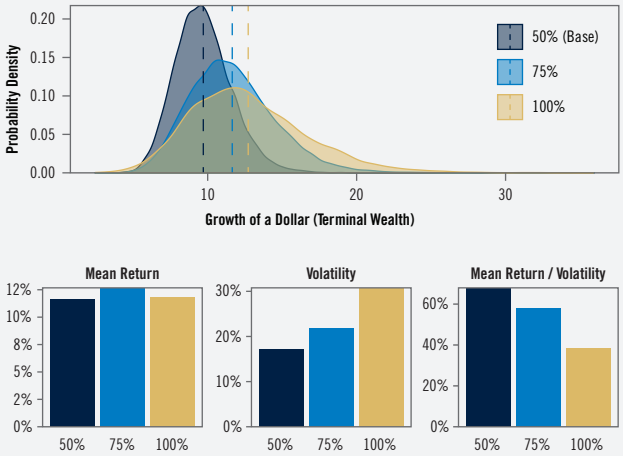
8 This a simple commitment strategy. A more sophisticated strategy may employ cash-flow modeling and projection, especially any information about upcoming capital calls or distributions. The strategy we consider may keep some amount of capital permanently uncommitted so that commitments are spread out uniformly over time to avoid skipping a vintage.

Figure 5: Varying Default Investment Choice (vs. Base Case)



No Skill, Subclass = US Buyout, Commitments / Vintage = 5, Commitment Strategy = 50%

Figure 6: Varying Commitment Strategy (vs. Base Case)



No Skill, Subclass = US Buyout, Commitments / Vintage = 5, Default Investment = S&P 500

Source: PGIM IAS, Burgiss. Provided for illustrative purposes only.

Sensitivity of the Number of Commitments vs. Base Case

At each period, LP investors must decide over how many funds (of a given vintage) to allocate their capital commitment amount. Committing to a single fund might produce a large increase in return volatility. However, while diversifying across many funds may reduce volatility, it may also reduce average fund quality. We explore the sensitivity of private market performance to the level of diversification across funds in a given vintage.

Figure 7 provides a comparison of terminal wealth resulting from making commitments to either one, five, or ten buyout funds in each vintage. Fund diversification can significantly improve risk-adjusted returns: from 0.25 (return per year/annual return volatility) with one fund per vintage to almost 0.70 with five funds, and 1.00 for ten.[9] Increasing from one to five funds improves the average mean return as well as decreasing volatility. Moving from five to ten funds does not change the mean return, but produces a further, but more modest, decline in volatility. However, it is not straightforward to conclude that ten commitments are better than five because, unlike the choice of default investment and commitment strategy, how many commitments that can possibly be made in a given vintage may depend upon other factors such as the private market strategy and skill type.[10]

Besides skill type, the most important assumption in the fair comparison framework is the number of commitments per vintage. More fund commitments can reduce risk but may also reduce the heterogeneity of the simulated portfolios.[11] Since our risk measure is based on the dispersion of horizon returns of these portfolios, reduced portfolio heterogeneity leads to *risk underestimation*. To be conservative in our analysis, we limit the maximum number of commitments to ten per vintage.[12] And, when measuring the sensitivity of an LP's other decisions, we fix the number of fund commitments at five.

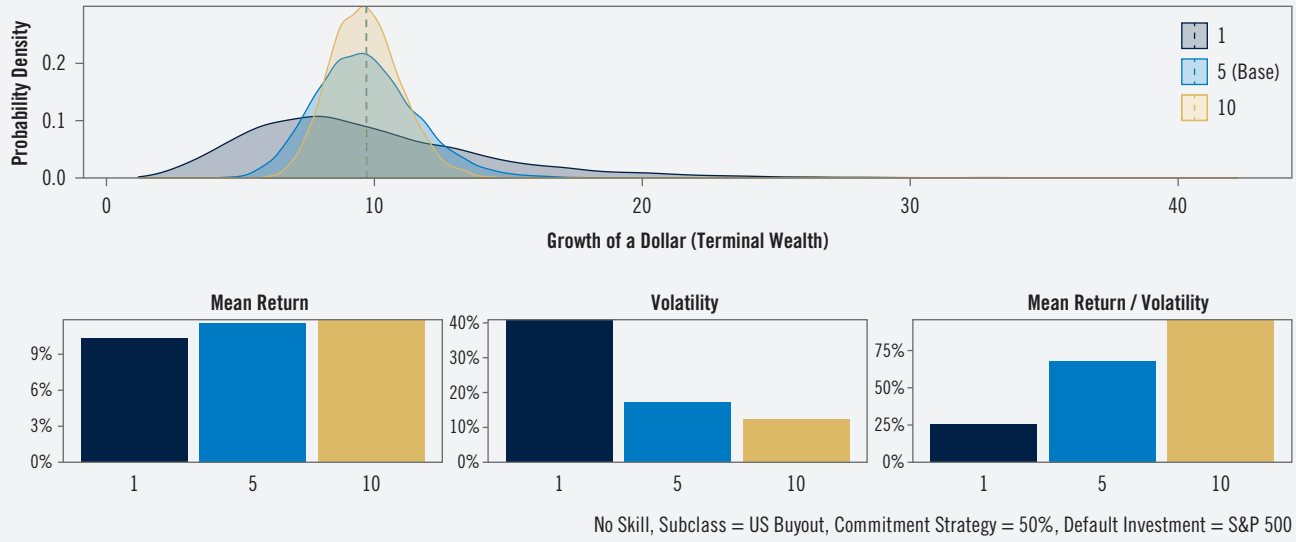
9 Risk-adjusted returns change significantly from one to five funds. From a return per unit of risk perspective, investing in one fund every vintage is equivalent to having a Hit or Miss skill type which is worse than No Skill.

10 For example, there are many more venture funds than real estate or buyout funds. Also, increasing the number of commitments may dilute fund-selection skill. Finally, the cost difference of managing five versus ten funds may be substantial which this analysis does not address.

11 We sample with replacement to partially address this issue. Using a population of five funds and sampling with replacement we build 126 portfolios of five funds each. However, using sampling without replacement produces only one portfolio as, in some vintages, there may be data only for five funds. See Appendix A for details on availability of fund-level data, in various categories, by vintage.

12 The choice of ten is not arbitrary. Committing to ten funds per vintage is sufficient to capture the mean return (similar to investing in all funds in a given market such as buyout or venture) from a private market with No Skill. With the exception of early-stage venture funds, this is true regardless of the choices for commitment strategy, default investment, or private market strategy. Once mean returns have stabilized, any further fund diversification may lead to a reduction of simulated portfolio heterogeneity.

Figure 7: Sensitivity of Number of Commitments vs. Base Case (Buyout Funds)



No Skill, Subclass = US Buyout, Commitment Strategy = 50%, Default Investment = S&P 500

Source: PGIM IAS, Burgiss. Provided for illustrative purposes only.

The previous section showed that buyout portfolio risk-adjusted performance improved by committing to more funds per vintage. Figure 8 shows this was also true for non-buyout strategies. However, venture funds behaved differently as investing in more funds significantly *reduced* mean returns.[13] For the non-venture strategies, mean returns improved when increasing from one to five funds, but going from five to ten funds either improved returns only a bit further or left them unchanged. However, for early venture, going from five to ten funds led to a significant drop in mean returns. Venture funds are different as their mean returns are characterized by occasional positive outlier performance, and fund diversification reduces the influence of these outliers. Excluding venture, the correlation of risk-adjusted returns with the number of fund commitments is similar for all private asset strategies.

Figure 8 also shows that Mezzanine and Real Estate portfolios with ten funds produce the best risk-adjusted returns of all the strategies due primarily to the sharp drop in portfolio volatility.

Value of Skill across Private Markets Strategies

Figure 9 shows that for a given skill type, holding the other base case assumptions unchanged, mezzanine and real estate fund portfolios produced the best risk-adjusted returns than the other strategies. Notably, early-stage and venture capital produced the worst returns across all skill types. Intuitively, one might think that with fund-selection skill venture would outperform all the other strategies. However, while returns improve with skill for these strategies, the volatility remains very high.

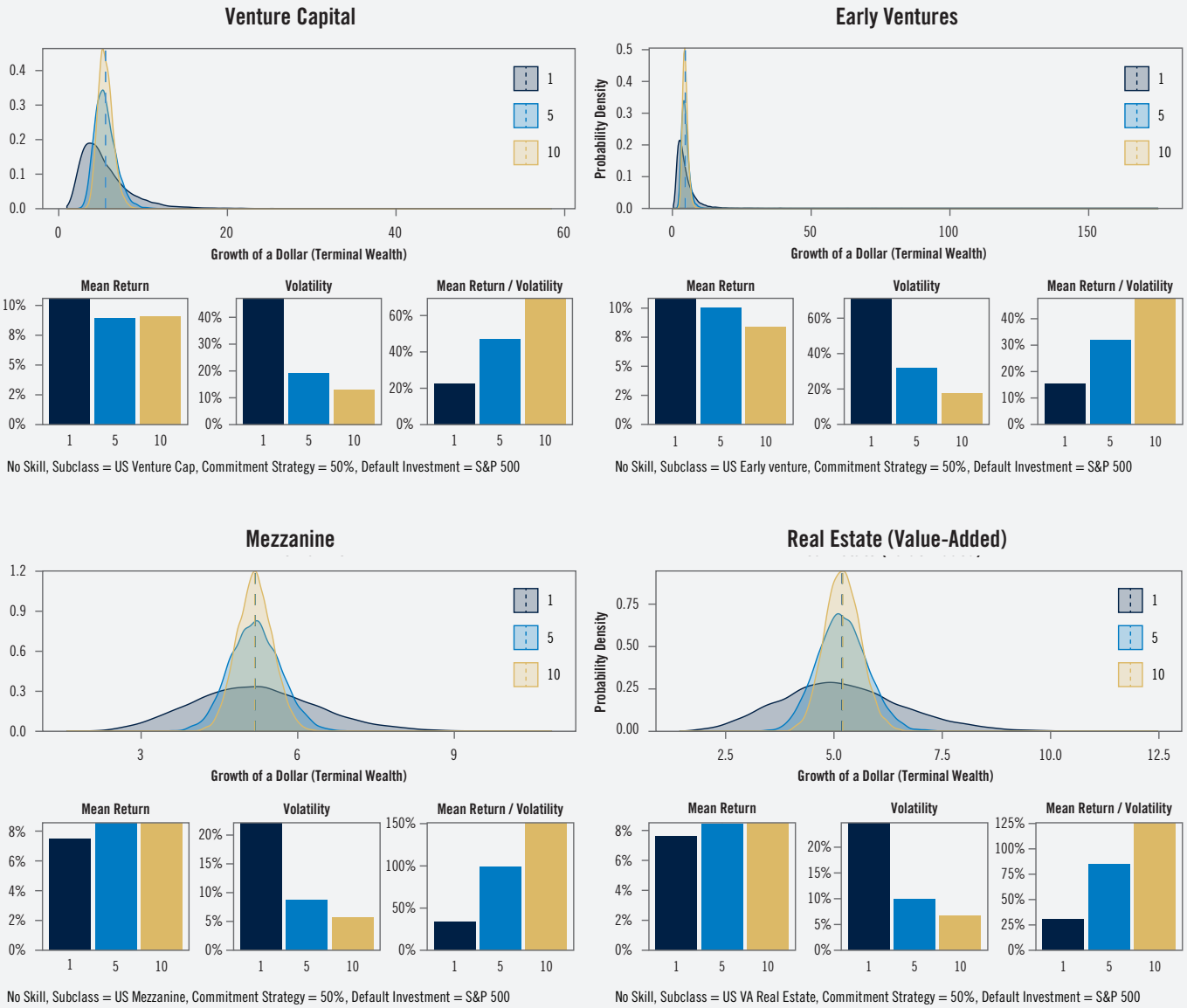
Comparing No Skill with Hit or Miss shows that the latter skill type delivered slightly better mean returns for venture funds, but lower mean returns for mezzanine and real estate funds. The mean returns for buyout did not change. Volatility for venture, on the other hand, increased by 30% to 40%, producing lower risk-adjusted returns. In contrast, for early-stage venture funds the volatility from Hit or Miss did not change thus helping to improve the risk-adjusted returns somewhat, but still lagging the other strategies. The case of early venture is different because even with No Skill these funds themselves are hit or miss kind of investments.

Compared to No Skill, the OK Skill did not improve mean returns for buyout, mezzanine, and real estate strategies. For venture funds it actually lowered returns by reducing the probability of extreme positive outcomes. Since extreme outcomes have a lower bound of zero but are unbounded on the upside, the net effect of the OK Skill is not supportive for mean returns. However, the OK Skill reduced risk by 15% to 25% for all strategies (except real estate which was unaffected) which improved risk-adjusted returns for buyout, mezzanine, and venture.

Compared with No Skill, venture returns benefited the most from the Some Skill followed by buyout, early venture, real estate, and mezzanine, in that order. However, in terms of volatility the order is different as the Some Skill reduced the risk of mezzanine the most, followed by early venture, real estate, buyout, and then venture. Using Some Skill and based on absolute improvement in their risk-adjusted returns mezzanine and real estate benefited the most, followed by buyout, venture, and early venture.

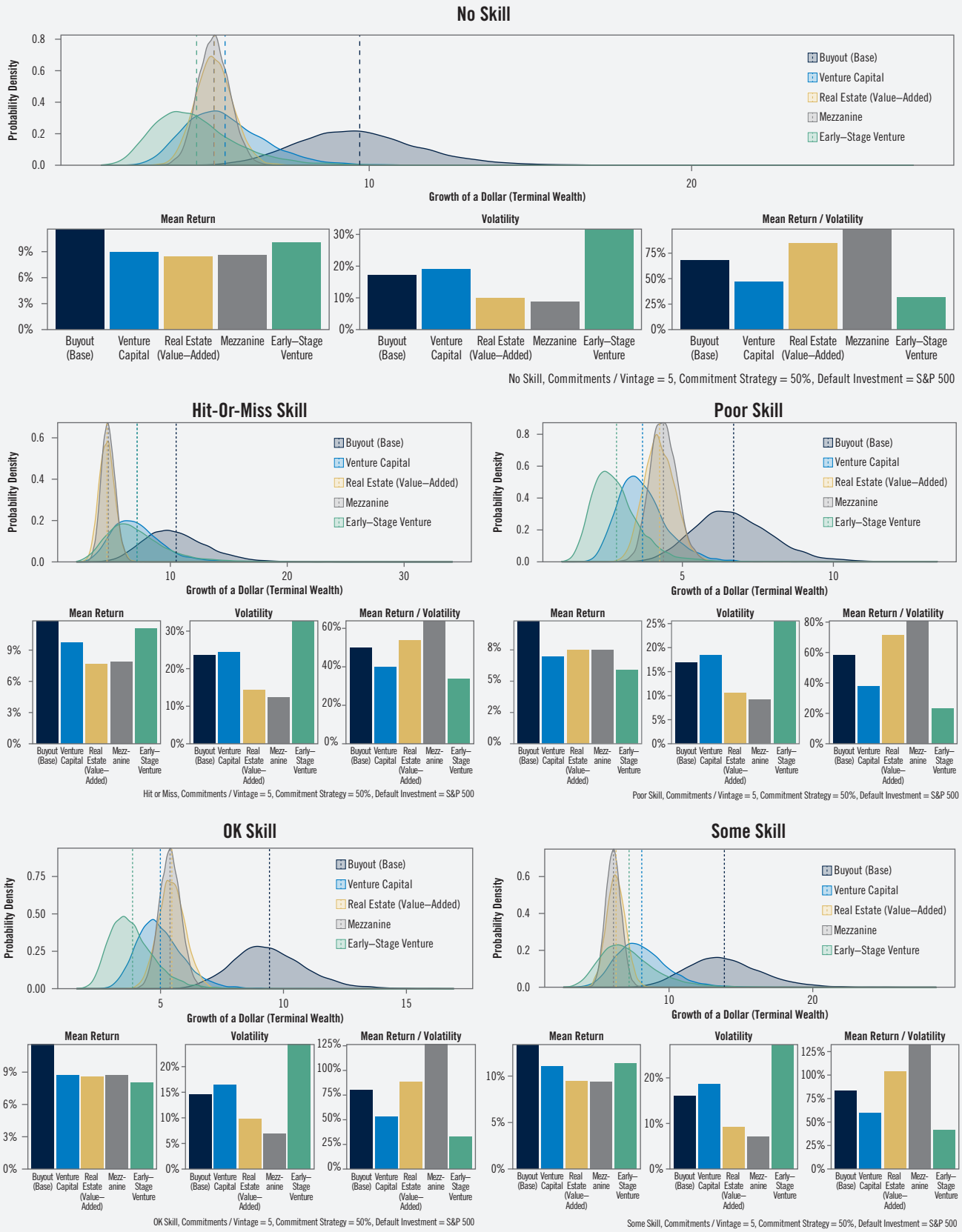
13 The distribution of venture funds returns has very significant positive skew (see Figure 8), leading to a mean that is much greater than the median. In a portfolio of venture funds, the performance of some extremely good funds is offset by some other not-so-good funds. This makes the distribution of portfolio returns less skewed. With many funds, the distribution is more or less symmetric around the mean.

Figure 8: Sensitivity to the Number of Commitments, by Private Market Strategy



Source: PGIM IAS, Burgiss. Provided for illustrative purposes only.

Figure 9: Performance of Private Market Strategy, by Fund-Selection Skill



Source: PGIM IAS, Burgiss. Provided for illustrative purposes only.

Bringing It All Together

Finally, Figure 10 compares the risk-adjusted performance of various private and public asset strategies (using the S&P 500 index as the default investment). Figure 10 considers three different settings: 1) "As Reported;" 2) "No Skill;" and 3) "With Skill" (*both* in public and private assets). The "As Reported" comparison uses the time series of quarterly IRR (cash flows and valuations pooled for all funds) for each private strategy to compute average annual returns and annual volatility. The "No Skill" comparison uses the fair comparison framework to compute the risk and return of private and public strategies but assumes the LP investor has no fund-selection skill.

The "With Skill" comparison also uses the fair comparison framework (assuming the Some Skill type) for both public and private market investments. For the public markets we use performance data for US large-cap Core equity managers from the eVestment universe between 2000-2018.[14]

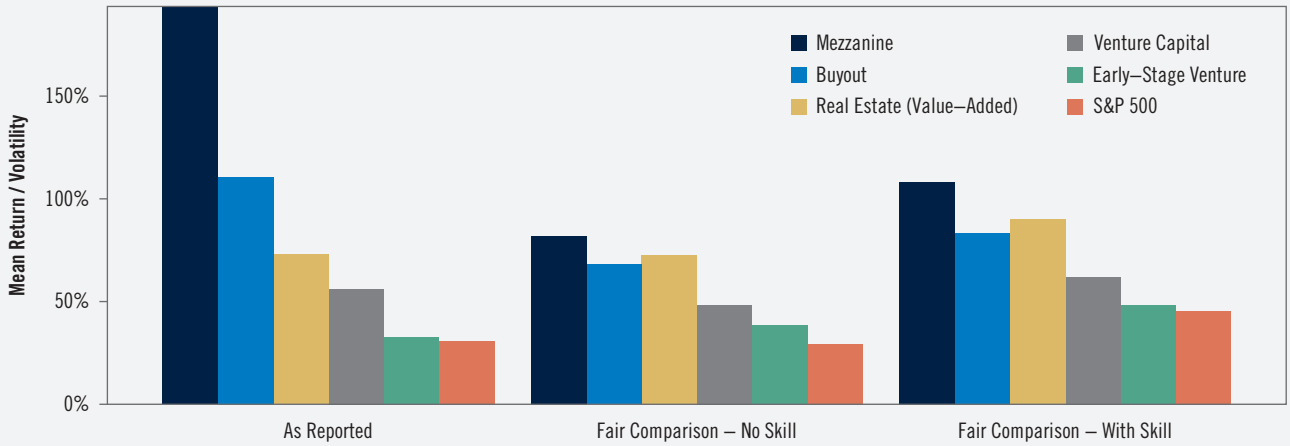
While the ordering of various public and private assets investments changes little from "As Reported" to "No Skill," (real estate took the second position pushing buyouts to third), the magnitudes of risk-adjusted returns did change significantly. As explained in our earlier paper, the fair comparison framework improves risk estimates as it does not suffer from return smoothing, unlike the "As Reported" numbers.

How does LP fund-selection skill affect the results? The "With Skill" ordering is again more or less the same as before, but the performance magnitudes improved.[15] Among private market strategies, mezzanine remained the best investment, followed by real estate. Early and late stage venture funds came in last, even with skill.

It is worth noting that the analysis presented in Figure 10 is sensitive to the choice of investment horizon, which is 2000-2018. On the other hand, the horizon used for Figure 1 is 2005-2018. In Figure 1, using the fair comparison framework, investing in the S&P 500 was competitive with buyout and mezzanine. However, in Figure 10 S&P 500's performance with or without skill is not so competitive. This is the effect of including the dot-com crisis period (in Figure 10) during which public markets were severely affected but most private markets except venture remained largely unaffected.

Compared to No Skill, Figure 11 shows the improvement in risk-adjusted return across private and public assets. Using our fair comparison framework, we find that LPs benefit the most by skillfully identifying good performing mezzanine and real estate funds followed by buyouts.

Figure 10: Comparison of Public Market with Various Private Market Strategies: 2000-2018



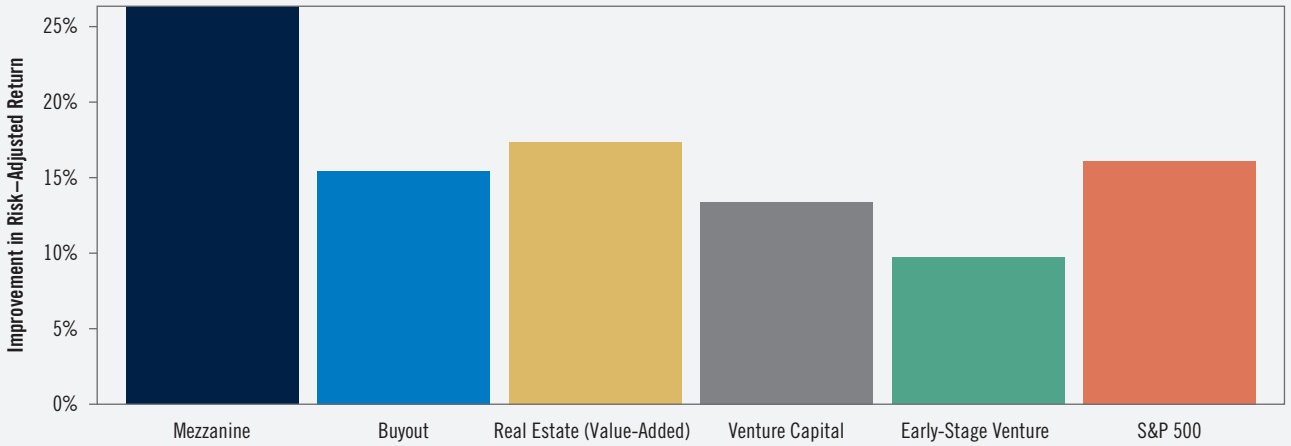
Some Skill, Commitments / Vintage = 5, Commitment Strategy = 50%, Default Investment = S&P 500

Note: The risk-adjusted returns for fair comparison are based on levered up (or down) portfolios to match the volatility of buyouts. We assume that the capital for leverage can be borrowed at the cost of 3mL plus spread of 100bp. We also assume a funding haircut of 10% across all investments.
Source: PGIM IAS, S&P, Burgiss, eVestment. Provided for illustrative purposes only.

14 We use a similar strategy to build a portfolio of US large-cap Core managers. Starting with a dollar we divide the capital into five managers (chosen randomly with Some Skill) equally and rebalanced annually. At the end of the 19y horizon we can compute average annual return and volatility experienced by the portfolio. We repeat the process 10,000 times.

15 The OASIS framework of Shen, et al. (2019) also allows investors to input their fund-selection skill when performing the tradeoff between performance and liquidity.

Figure 11: Value of Skill in Various Investments
Change in Risk-Adjusted Performance Moving from No Skill to Some Skill



Some Skill, Commitments / Vintage = 5, Commitment Strategy = 50%, Default Investment = S&P 500

Note: The y-axis is the absolute (not relative) change in risk-adjusted returns when the skill is employed.
Source: PGIM IAS, S&P, Burgiss, eVestment. Provided for illustrative purposes only.

Conclusion

Using our fair comparison framework, we explored the impact of choices an investor in private markets must make including where to invest uncalled and uncommitted capital, the choice of private market strategy, the level of commitment pacing, and the degree of fund diversification per vintage. In addition, we explored the impact of an LP's fund-selection skill on the risk and return profile of the private capital portfolio.

Given the interplay of the many choices an investor must make, we examined whether there is a class of funds that respond to a type of fund-selection skill more than others. Somewhat counter-intuitively, we found that venture funds (especially early stage) may not benefit the most, in terms of risk-adjusted returns, from fund-selection skill. While mean returns improved, volatility persisted. Mezzanine and real estate funds benefited the most from fund-selection skill.

Among the private market strategies, we found that mezzanine performed best in terms of risk-adjusted returns, irrespective of fund-selection skill. However, mezzanine is a small market compared to buyout and real estate, hence there may be less opportunity for larger investments and cross-sectional diversification.[16] The next best strategy is real estate followed by buyout. Venture investments had the lowest risk-adjusted returns because of their high underlying risk, but they still offered a better investment opportunity than public markets, with or without skill.

16 This is a separate issue from the one mentioned earlier about risk underestimation due to smaller number of funds in a category. The issue here is about the size or the capacity of the market. Unlike buyout and real estate one cannot invest a very large amount of capital in the mezzanine market.

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Appendix A

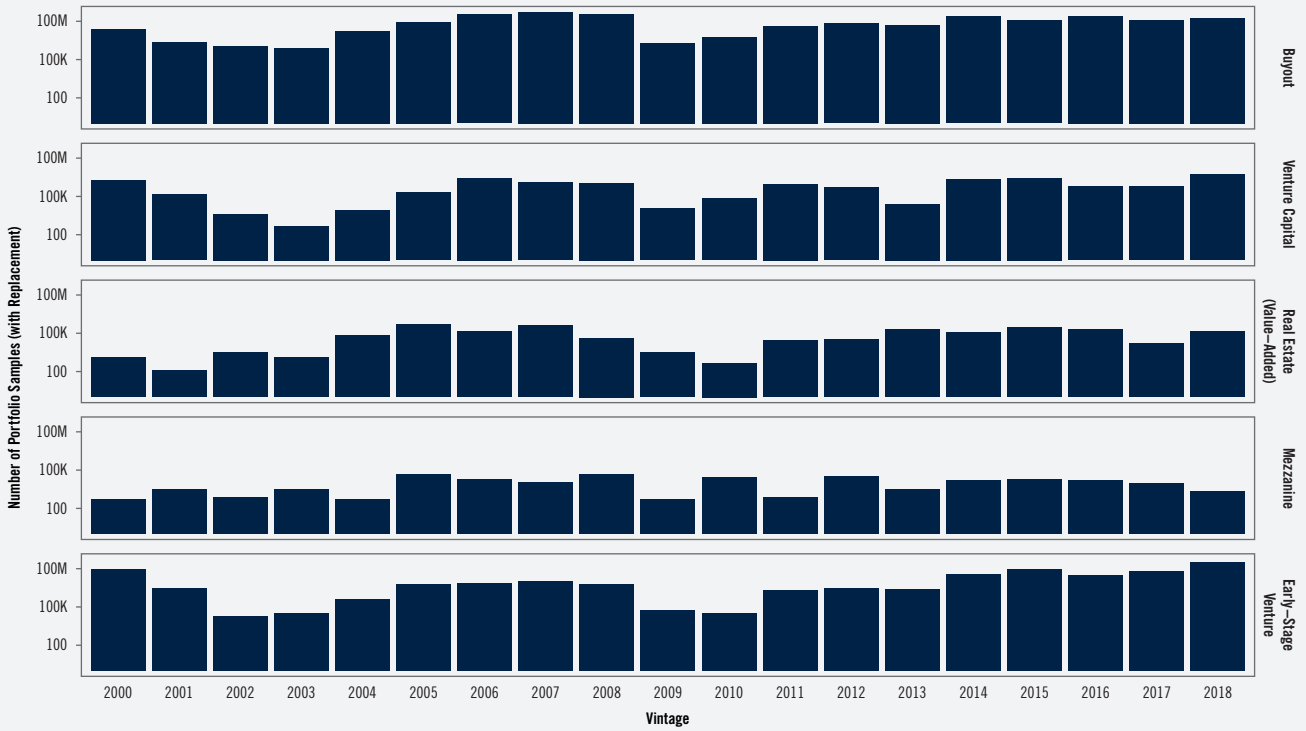
Figure A1 displays, by vintage, the number of funds available in the Burgiss database in different categories of private capital funds. There are plenty of buyout and early-stage venture funds. Mezzanine has the smallest number of funds with a maximum of 20 and a minimum of 7. The dark-blue bars are ones when the number funds are less than ten. In vintage 2001 there are only five value-added real estate funds indicated by the gold bar.

Figure A2 shows vintage-wise number of possible random portfolios (Nv). The total number of portfolios that contain funds from each vintage is the product of all Nvs.

Figure A1: Number of Funds per Vintage

Source: PGIM IAS, Burgiss. Provided for illustrative purposes only.
Note: For clarity the y-axis is on different scale for each category of funds. The two horizontal line are drawn at five (green) and ten (red).

Figure A2: Possible Number of Portfolios per Vintage
Number of Commitments = 5, with replacement



Source: PGIM IAS, Burgiss. Provided for illustrative purposes only.
Note: Y-axis is drawn on the log scale

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