

**Smart Institutions, Foolish Choices?:
The Limited Partner Performance Puzzle**

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The returns that institutional investors realize from private equity investments differ dramatically across institutions. Using detailed and hitherto unexplored records of fund investors and performance, we document large heterogeneity in the performance of different classes of limited partners. In particular, endowments' annual returns are nearly 14% greater than average. Funds selected by investment advisors and banks lag sharply. Analysis of reinvestment decisions suggests that endowments (and to a lesser extent, public pension funds) are better than other investors at predicting whether a follow-on fund will have high returns. We find that the results are not primarily due to endowments' greater access to established funds, since they also hold for young or under-subscribed funds. Our results suggest that limited partners vary in their level of sophistication and also their objectives. Finally, we find that there are large and persistent differences in performance and investment strategies even at the level of the individual limited partner.

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1. Introduction

Over the past three decades, institutional investors have controlled an increasing share of the U.S. equity markets: Gompers and Metrick (2001) calculate that their share of U.S. public equity markets exceeded the 50% threshold in 1995.¹ There is a significant and growing literature in financial economics that seeks to understand the investment decisions of institutional investors and the differences between the various classes of investors. For example, Gompers and Metrick (2001) document that institutional investors hold stocks that have greater market capitalizations, are more liquid, and with higher book-to-market ratios and lower returns in the prior year.² The literature thus far has focused mainly on the differences between institutional and individual investors.

One question that has attracted much less scrutiny, however, is the heterogeneity in performance and investment strategies *across* different types of institutional investors. (Bennett, Sias, and Starks (2003) and Table 2 of Gompers and Metrick (2001) are rare exceptions.) While institutional investors as a group vary substantially from retail investors due to the larger size of their portfolio or the resources available to them, there

¹Their calculation only examines institutions with greater than \$100 million of securities under discretionary management that are required to file a 13F form with the U.S. Securities and Exchange Commission. Thus, their estimate is a lower bound on institutional holdings.

²Of course, this pattern may reflect more frequent trades or other attributes. Massa and Phalippou (2004) seek to econometrically identify mutual funds' preference for illiquidity. Other studies have suggested that institutional investors are less likely to buy stocks on days with high trading volume (Barber and Odean (2003)) or to herd into particular stocks (Lakonishok, Shleifer, and Vishny (1992) and Grinblatt, Titman, and Wermers (1995)) and that their investments fall into a few well-defined styles (Froot and Teo (2004)).

are also systematic differences *across* institutions in organizational structure, investment objectives, or even the perceived level of sophistication. A number of recent theoretical papers suggest that these organizational differences can have profound implications for investment decisions, portfolio allocations, and ultimately, investment returns.³

In the current paper we analyze whether there are systematic differences in the returns and investment strategies across institutional investors. The asset class that we focus on is private equity. Since it is generally believed that the private equity market is less efficient than public markets, differences among institutions should be most pronounced here. We analyze investment styles and performance across several different classes of investors, known as limited partners (LPs), e.g., banks, corporate and public pension funds, endowments, advisors, insurance companies, and others.

We begin with the identification of a puzzle: different classes of investors in private equity have enjoyed dramatically different returns over the past decade. Using detailed records—hitherto unexplored by academics—of the composition and performance of funds that are selected by different classes of LPs, we document substantial differences in returns. The average returns of private equity funds that endowments invest in are nearly 14% greater than the average LP in our sample. Funds

³For example, Shleifer and Vishny (1997) suggest that information asymmetries between investors and intermediaries create limits to arbitrage that can affect the portfolio strategies and eventually the returns of the latter. (Similarly, see Gromb and Vayanos (2002).) Because the extent of agency problems may differ dramatically across institutions, considerable differences in the behavior of institutional investors could be expected.

selected by investment advisors and banks lag sharply. These differences in performance hold even if we control for the vintage year and type of the fund and other observable characteristics. Controlling for these observable characteristics is important, since earlier studies have shown that private equity returns vary strongly with fund characteristics and are subject to large cyclicity. (See, for example, Gompers and Lerner (1998, 2001) and Kaplan and Schoar (2004).) We also find that within the different groups, older LPs tend to have better performance than LPs that enter the industry at a later time. These differences are particularly significant for corporate pension funds. These results may suggest that younger LPs are less experienced in private equity investing.

We find parallel patterns when we explore the reinvestment decisions across the different classes of LPs. The decision to reinvest in the next fund of a general partner (GP) is the central means by which LPs can adjust their portfolio and exert governance pressure on the GP, since private equity is a very illiquid asset class where investors have little recourse to their investment once the capital has been committed. We find that endowments and corporate pension funds generally are much less likely to reinvest in a given partnership than all other LP classes. Moreover, follow-on funds in which endowments (and to a lesser extent, public pension funds) decide to reinvest show much higher performance than those funds where they decided not to reinvest, suggesting that these LPs are better at forecasting the performance of follow-on funds. Other LP classes do not display these performance patterns. Corporate pension funds and advisors, in fact, are more likely to reinvest if the *current* fund had high performance, but this often does not translate into higher future performance. These findings suggest that endowments

proactively use the information they gain as inside investors to improve their investment decisions, while other LPs seem less willing or able to use this information.

There are a number of candidate explanations for the observed heterogeneity in performance other than differences in sophistication. First, LPs might differ in the risk profile of the funds that they choose. For example, endowments could be systematically investing in riskier funds and therefore have higher returns. Second, LPs may vary in their objective functions. Finally, anecdotes in the private equity industry suggest that established LPs often have preferential *access* to funds. The performance differentials might thus be due to historical accident: endowments through their early experience as LPs may have greater access to established groups with high performance. We analyze these different explanations in turn.

To address the concern that differential performance may be driven by variation in the risk profile of the funds that LPs choose, we control for a number of observable characteristics that are generally considered risk factors, such as the focus and maturity of the investments selected by a fund, the fund's size, age, and location. While our results are robust to these controls, we cannot completely rule out the possibility that unobservable risk factors might affect our results. Therefore, we also analyze if the ex-post variation in portfolio returns is larger for those classes of LPs that have higher average returns. If endowments achieve their superior returns by taking on riskier investments, we should expect that they have a higher variation in performance across their private equity investments. When we compare the standard deviations of returns

across the different LP classes, we indeed find that endowments are among the LP classes with higher variance. However, this variance is entirely driven by the positive skewness of the return distribution of endowments. Once we condition on the lower 75% of the funds across all LPs, we see that endowments in fact have the lowest variation across all LP classes. These results do not support the idea that endowments achieve their superior performance by relying on riskier investment strategies.

Second, the concern that performance differences across LPs could in part be the result of differences in the objectives of LPs should be most important for banks and public pension funds. For example, Hellmann, Lindsey, and Puri (2004) suggest that banks might diverge from maximizing returns on investments in order to obtain future banking income from the portfolio firms. We find, however, that banks underperform the other LPs not only in the buyout industry (where considerations about future business might be important), but even in VC deals where the benefits from selling future services seem much smaller. Moreover, banks with a small fraction of their profits from corporate clients also underperform. Similarly, public pension funds might face constraints to invest in in-state funds to support the local economy. We therefore compare the performance of in-state funds across LPs and indeed find that public pension funds underperform other LPs in their in-state funds. But it is unlikely that this explains the full difference in performance, since public pension funds underperform endowments in their out-of-state investments as well.

Third, we explore the possibility that the superior performance of endowments or public pension funds results from preferential access to better funds. We test this hypothesis in several ways. First, as noted above, we examine the reinvestment decisions of LPs. Once an LP has invested in a fund, it generally has access to the subsequent funds raised by the GP. We find that, even if we condition only on reinvestments, endowments exhibit much better performance than all other LPs, suggesting that they are better able to predict future performance of the GP. Next, we examine only investments in young private equity groups (those established after 1990). If the performance difference is mainly driven by the superior access of established LPs to older private equity groups, conditioning on younger GPs should eliminate the difference in performance. We again find a performance premium for endowments and public pension funds, though the difference is smaller than in the analysis using all GPs.

A final concern is that top performing young funds might try to “upgrade” their investor base and allow preferential access to endowments which are considered prestigious LPs.⁴ To address these concerns, we collect two variables that proxy for the ease of access to a fund: (1) an indicator as to whether a fund was over-subscribed and (2) the time a fund took to reach its target fundraising. The idea is that GPs that are able to raise a follow-on fund above the target size (and those that close very quickly) have excess demand and can therefore be more selective in who they allow to invest. If endowments even outperform in funds that do not seem access constrained, it would suggest that differential access by itself cannot explain our results. When we compare

⁴We thank Paul Gompers for pointing out this possibility.

the returns on investments in under-subscribed funds (funds that take a long time to close) for endowments and other type of LPs, we find that endowments still outperform other LPs. While these findings do not support the idea that the superior performance of these LPs is merely driven by historical accident, we cannot completely rule out that some of the performance difference is due to their access to superior funds.

In the final part of the paper, we examine whether there are persistent differences across LPs in their performance and the selection of intermediaries. For that purpose we undertake an analysis of LP specific fixed effects. We find significant differences in investment styles across LPs in the sample. LPs display persistent differences in their investment returns and the investment strategies they adopt seem to vary widely in terms of the size, age, and geographic location of funds that they invest in.

The results can potentially shed light on the large cycles in the private equity market that a number of papers have documented, including Gompers and Lerner (1998, 2000) and Kaplan and Schoar (2004). The work of Lerner and Schoar (2004) implies that, optimally, LPs would use their inside information to screen out poorly performing GPs. The fact that many classes of LPs appear not to be using their information optimally (and reinvest even if past performance was poor) distorts the resulting equilibrium. The presence of uninformed or performance-insensitive LPs allows poorly performing GPs to raise new funds and thus makes exit as a governance mechanism of sophisticated LPs less effective.

This paper is also related to the literature on the establishment of private equity funds. Poterba (1989) and Gompers and Lerner (1998) explore how tax and other public policies affect venture capital (VC) fundraising. Gompers and Lerner (1996) and Lerner and Schoar (2004) examine the contracts entered into between investors and funds, and how they are affected by the nature of the targeted investments and the limited partners. Mayer, Schoors, and Yafeh (2003) examine the sources of VC financing across countries, and how these are correlated with investment choices. Kaplan and Schoar (2004) study how the level of returns affects the ability of private equity groups to raise follow-on funds. Probably the closest paper is Gottschalg, Phalippou, and Zollo (2003), which highlights the puzzlingly low performance of private equity funds raised between 1980 and 1995. The authors speculate that the puzzle may be due to a lack of understanding or sophistication on the part of some investors, such as pension funds. But the drivers and consequences of the decisions by individual LPs to invest in private equity funds have been hitherto unexplored, largely because the data has been unavailable until very recently.

The organization of this paper is as follows. Section 2 briefly describes the selection of private equity funds by institutional investors. Section 3 summarizes the data used in the analysis. Section 4 presents the analysis of performance. Section 5 examines reinvestment decisions; Section 6, the performance of young, under-subscribed, and slow-to-raise funds. Section 7 presents the LP-level analysis. The final section concludes the paper.

2. Institutions and Private Equity⁵

The bulk of institutional investment in private equity is done through separate funds run by professional managers (the GPs). The selection of appropriate direct investments requires resources and specialized human capital (such as due diligence skills) that few institutional investors have. The funds are raised for a specified period (typically a decade, though extensions may be possible) and are governed by an agreement between the investors (the limited partners) and the principals in the fund (the general partners), which specifies the nature of the fund's activities, the division of the proceeds, and so forth. Private equity groups will typically raise a fund every few years, beginning the fundraising process as the investing the previous fund is being completed.

Numerous accounts by both objective observers and practitioners suggest that there are substantial differences in the investment criteria of various classes of private equity investors. For instance, the manager of a large endowment highlights the advantages that private university endowments enjoy this way (Swensen (2000)):

[Endowments] on the cutting edge choose from a broader opportunity set. By examining nontraditional asset allocations, investors improve the chances of finding a portfolio mix well suited to the institution's needs. By considering alternatives outside the mainstream, investors increase the likelihood of discovering the next big winner well before it becomes the next big bust. By evaluating managers without the requisite institutional characteristics, investors might uncover a highly motivated, attractive group of partners. Operating on the periphery of standard institutional norms increases opportunity for success.

⁵This section is largely based on the industry notes and cases in Lerner, Hardyman, and Leamon (2004).

Swensen and other authors (see, for instance, Fenn, Liang and Prowse (1995)) also discuss the private equity investment approaches employed by advisors and financial institutions. Investment advisors, sometimes known as “funds-of-funds,” aggregate capital from a number of LPs, and then invest it in a variety of private equity funds. In recent years, as more public pension funds and individual investors have begun investing in private equity, funds-of-funds have become more prominent. Because these groups are compensated primarily by assets under management, and because it can take a long time to detect inferior performance, in some cases groups may be tempted to garner more assets than they can reasonably expect to deploy. The motivations for banks’ investment activities are frequently more complex than those of other LPs. For instance, many banks generate substantial profits from lending to firms undergoing leveraged buyouts or else from advising on these transactions. As a result, they may invest in a buyout fund that they do not expect to yield high returns, if the investment will increase the probability that they will generate substantial fee income from the group’s transactions.⁶

3. The Data

As noted in the introduction, the primary barrier to research of this question has been data availability. The greater disclosure in recent years of private equity

⁶Banks were early investors in venture capital, and continue to be active today. Because their equity ownership of commercial enterprises was historically restricted, commercial banks typically invest in private equity through separately capitalized bank holding company subsidiaries. (Under Section 4(c)(6) of the Bank Holding Company Act of 1956, bank holding companies may invest in the equity of companies as long as the position does not exceed more than 5% of the outstanding voting equity of the portfolio company, which is unlikely to be the case if the bank is just one of many limited partners in a fund. In addition, many banks also make direct investments in private firms through licensed Small Business Investment Companies (SBICs). (For a discussion of these issues, see Fenn, Liang, and Prowse (1995) and Hellmann, Lindsey and Puri (2004).))

investments has allowed us to overcome this barrier. This section describes the data sources we employ.

Investment decisions. To ascertain which institutional investors had invested in which private equity funds, we employed two sources. Our primary source was the compilation of private equity investors by Asset Alternatives. Since 1992, Asset Alternatives has sought to compile the investors in private equity funds through informal contacts with the funds and investors themselves. This information is included as part of their *Directory of Alternative Investment Sources*, though the underlying data has not been made hitherto available to researchers. While their database is not comprehensive, it covers a large and diverse fraction of the private equity industry.

The second source comes from the investors themselves. Numerous public pension funds disclose the funds in which they have invested. In some cases, this information was contained in annual reports that were posted on the Internet; in other cases, this information was provided by funds after a written request. In addition, a number of private investors with whom the authors had personal relationships provided us with confidential listings of the funds in which they had invested. We obtained detailed information about these portfolio allocations from 20 different institutional investors.

Fund characteristics. We collected information on the fund size, stage, the previous funds raised, etc., from the Asset Alternatives funds database (included as part

of their *Galante's Venture Capital and Private Equity Directory*, though typically again not shared with researchers), supplemented whenever possible by Venture Economics' online funds database if information was missing in Asset Alternatives. We distinguished between the overall count of the fund and its sequence within a particular family of funds. In addition, we used the data on management fees and carried interest of funds from Gompers and Lerner (1999), updated through the review of the records of a number of LPs who gave us access to their files. In total, our database covers 1,397 separate funds that belong to an LP portfolio in our sample.

Fund returns. We use a measure of performance that is very widely used for private equity funds, namely the internal rate of return (IRR), which has the advantage that it allows comparison on a like-for-like basis (e.g., between funds of similar types and vintage years). Our primary source for return data was Private Equity Intelligence's *2004 Private Equity Performance Monitor*, which presents return data on over 1,700 private equity funds. This information is compiled by Mark O'Hare, who over the past five years has created a database of returns from public sources (e.g., institutional investors who have posted their returns online), Freedom of Information Act requests to public funds, and voluntary disclosures by both GPs and LPs.⁷ Private Equity Intelligence makes its own assessment of the reliability of the different sources of performance data available (*i.e.*, reported by LPs and/or GPs, or calculated internally based on realized cash flows and valuations of LPs' remaining interests in the funds), and presents the figure

⁷O'Hare has been highly successful at gathering data not only on the returns of new funds, but also many of the most established in the industry.

considered most reliable. Ideally, we would like to be able to calculate the IRR figures ourselves using cash flow data, but unfortunately we do not have access to this level of detail on funds' cash flows. We cross-checked and supplemented the Private Equity Intelligence data with the return data that we had previously gathered from public sources. Note that we will only use IRR data in our sample for funds established prior to 1999 (and we verify the results for a sample of funds raised prior to 2002), since this performance metric is unlikely to be very meaningful for younger funds.⁸ IRRs are reported net of fees and carried interest.

Another potential problem of using IRR is that it is a non-linear measure of performance. If the variance in returns is very different between classes of funds, it could potentially bias our results. To address this concern we repeat all the analysis in our paper using the value of actual distributions received by the limited partners (expressed as a percentage of the fund's committed capital) as the measure of fund performance, and all the results are unchanged. We also find that the correlation between the different performance measures, such as IRR, distribution to committed capital or value multiples are very high, between 75% and 98%.

Institutional investor characteristics. We compiled information on the overall size of the assets managed by the LP, the length of each institution's experience with private equity investing, and its geographic location from Venture Economics' *Directory*

⁸It is well known that IRRs with a large component relating to unrealized portfolio valuations are highly subjective. This element of subjectivity is particularly prominent in the early years of a fund's life, and will not be resolved until the realization of all the fund's assets. By using only funds that closed before 1999, we ensure that at least five years of cash flows have been realized.

of Private Equity Investors and Asset Alternatives' Directory of Alternative Investment Sources.

4. Analysis

4. 1. Descriptive Statistics

Table 1 presents descriptive statistics of the 1,397 funds and 417 limited partners in our main sample. Data on characteristics of interest were not always available. We indicate in Table 1 the number of non-missing observations. Panel A of Table 1 shows statistics of the funds, broken down into three categories: early-stage venture capital, later-stage venture capital, and buyout funds. Our sample is split relatively evenly across these three types of funds. While we have a limited amount of data on carried interest and management fees, we have fund performance data for close to half of the funds in our sample.

Fund Characteristics. The average fund in our sample that LPs invested in is \$407 million, but there is large heterogeneity among funds. The smallest fund is \$4.5 million dollars, while the largest one is \$6.1 billion. Not surprisingly, buyout funds are much larger with an average size of \$660 million, while later-stage venture funds average \$330 million and early-stage VC funds average \$210 million. The average fund is a fourth fund (the average sequence number is 3.7), but there is substantial variation ranging from partnerships that are in their first fund to those that have raised 32 funds. Our sample contains funds that were raised between 1991 and 2001, and the average fund in our sample was closed in 1997. We find that venture capital funds tend to be

somewhat older (average sequence number of later-stage VC funds is 4.2), reflecting the longer history of this segment of the private equity market.

Performance. We find that the average fund in our sample has an (unadjusted) IRR of 6.7 percent, but again there is a lot of dispersion: the worst fund returned negative 94 percent while the best performing fund had an IRR of more than 500 percent. The average performance in this sample might seem very low. But it is important to note that this sample includes all funds up to 2001, which might include a fair number of funds that have not been fully liquidated. Therefore, we also report the average performance for all funds that were raised prior to 1999 (and thus had at least 5 years to realize returns). If we condition on this sample, we see that the average IRR across all funds in the sample is 24% (excess returns of 11%). This performance is comparable in magnitude (but a little higher) to the average performance found in Gompers and Lerner (2001), Kaplan and Schoar (2003), and Jones and Rhodes-Kropf (2003).⁹ Over the entire period, we also find that early- and later-stage venture funds in our sample had significantly higher performance than the buyout funds; 14 percent and 8 percent versus 0 percent, respectively (on an unadjusted basis). As Gompers and Lerner (1999) show, the majority of funds have a fee structure with carried interest of 20% and management fees of 1.5% to 2.5%.

⁹The differences with Ljungqvist and Richardson (2003) are more substantial. This reflects the fact that the former sample is primarily from the 1980s (1992 and 1993 are the only years of overlap between the two samples). It also appears to reflect some selection effects among 73 funds in those authors' sample, since the patterns do not appear to conform to the more general trends identified by Venture Economics.

Geographic Distribution. Finally, we see that the funds in our sample are concentrated on the East and West Coasts, with 47 percent and 31 percent of the U.S. funds in the sample respectively. Only 23 percent of the funds are based in the South or the Midwest. When differentiating by type of fund, we see that the majority of early-stage venture capital funds are based in the western United States (56 percent), while 50 percent of later-stage VC and 62% of buyout funds are based in the northeastern region. This is not surprising since the buyout industry tends to be concentrated around New York and early-stage venture funds around Silicon Valley.

Composition of Limited Partners. Panel B of Table 1 describes the distribution of limited partners in our sample and their characteristics. Endowments comprise the largest group, with 100 LPs, followed by public pension funds (74) and corporate pension funds (72). When we differentiate among the different sub-classes of endowments, we find that the majority of endowments in our sample are private university endowments (63), followed by foundations (27) and public university endowments (10). There are 66 advisors in the sample, 32 insurance companies, 30 commercial and investment banks, and 43 LPs that cannot be classified in any of the above categories. (Among such LPs are investment agencies of foreign governments, corporate venturing departments of large corporations, and religious organizations.) Advisors and public pension funds constitute the largest amounts of capital committed to the industry overall (averaging \$3.6 billion and \$2.2 billion committed to private equity investments, respectively).

Sample Period. Panel C shows the breakdown of vintage years for the funds in our sample. The number of funds in our sample increases over the 1990s. This is due to two different phenomena. First, the coverage of the Galante's database appears to become more comprehensive in the later part of the sample period. Second, the 1990s represent a period of massive growth of the private equity industry, in terms of the number of funds raised and the number of investors participating in the industry. To alleviate concerns that sample selection issues due to improved coverage of LPs over time might drive our result, we replicate our findings for the sample of 20 LPs where we have their complete investment history.

Availability of fund performance data. Panel D displays characteristics of funds for which we were able to collect performance data, compared to the entire sample. IRR data is available for just over 40% of all funds in the sample across the various fund categories (early-stage VC, later-stage VC, and buyout funds). The funds for which we have performance data tend to be slightly larger in size, have higher sequence numbers, and have more LPs investing in them. Finally, in Panel E we check for potential selection bias in the reporting of returns in our sample. We show that the annual average IRRs in the Venture Economics database do not appear to differ systematically from the average IRR in our sample.

4. 2. Performance Differences across LP Classes

Table 2 provides an overview of the investments made by each type of limited partner in the different fund categories. There is enormous heterogeneity in the

performance of funds in which different groups of institutions invest. The funds that endowments invested in have by far the best overall performance, with an average IRR of 20 percent. This high performance is, however, entirely driven by endowments' VC investments. On average, early- and later-stage VC funds that endowments invested in returned an IRR of 35 and 19 percent, respectively. In contrast, the buyout investments of endowments only had an IRR of less than one percent. Overall, endowments had a very positive average, since they invested in many more venture capital funds than buyout funds.

If we now break down endowments into the different types (public, private, and foundations), we find that foundations and private university endowments have higher IRRs than public endowments.¹⁰ All endowments perform relatively poorly in the buyout arena. This difference in performance across classes of private equity investments might suggest that endowments have specific human or organizational capital that allows them to outperform in the VC investments.

The picture looks quite different for public and corporate pension funds (and to some extent, insurance companies). On average, the funds that these classes of LPs invested in had more moderate IRRs (eight percent and five percent, respectively). But the drivers of positive returns are less skewed for this group. The average VC fund these

¹⁰This difference becomes particularly large when we form the weighted average IRRs discussed below. Public endowments have a weighted average IRR of 3.2% while private university endowments and foundations have a weighted average IRR of 19.1% and 23.3%, respectively. Interestingly, public university endowments perform much worse across all different types of private equity classes relative to other endowments once we weight by size.

LPs invested in had an IRR of slightly over 10 percent, while their buyout funds had an IRR of two percent. Finally, we see that the funds picked by advisors and banks on average had very poor performance (IRRs of negative two and negative three percent, respectively). This trend seems to hold across all different types of private equity investments. Interestingly, bank and finance companies picked particularly poor performing funds among the early-stage VC funds (IRR of negative 14 percent). We must be careful not to interpret these findings as the overall performance of the private equity portfolio of these groups, however, since this calculation does not reflect the *actual size* of the allocations to each of the different funds. This exercise represents the ability of different groups of LPs to identify (good) funds on average.

We also estimated the LPs' investment performance by assigning weights to each LP's commitment as follows. For investments where the dollar amount committed to the fund and the overall private equity commitments by the LP are available, we weighted the returns from each fund by the amount committed to the fund in relation to the LP's total private equity commitments. For all remaining funds in an LP's portfolio for which the commitment amount was not known, we simply assumed that the LP invested an equal amount in each fund. The results of this exercise indicate that the performance changes little.¹¹

¹¹Table 2 also reveals that public and corporate pension funds tend to invest in larger funds, whereas endowments and insurance companies invest in smaller funds. Public pension funds also tend to invest in funds with higher sequence numbers. Interestingly, we see that the smaller fund size for endowments is driven by their allocations to small buyout funds and the greater share of venture capital funds in their portfolio: the VC funds they invest in are larger on average. We find that insurance companies and banks tend to invest in early funds (lower sequence numbers) across all fund categories.

4. 3. Are these Performance Patterns Robust?

A natural question is whether these univariate results are robust to controlling for the time period when the investments were made, or the choice between venture and buyout funds. For these and subsequent analyses, we will analyze investments at the LP-fund level (except for Table 4, which is conducted at the fund level): that is, we will use each investment by an LP in a fund as a separate observation. We control for the fact that we have multiple observations by clustering the standard errors at the fund level. We regress the realized IRR of a fund on a set of dummies for the different classes of LPs and control variables for year fixed effects, fund category fixed effects, the year the LP's private equity investment program was launched,¹² and the geographical co-location of the GP and LP. Public pension funds are the omitted category from the set of LP dummies. We only include funds that were started before 1999 to guarantee that a majority of the returns of the funds have already been realized.

In Table 3, column (1) shows that funds in which endowments invest outperform public pension funds, while on average other LPs pick funds that underperform relative to those groups. In particular, corporate pension funds and banks invest in funds with significantly lower IRRs. To understand the difference in the performance of endowments in more detail, we also replicate this regression where we distinguish between private university endowments, public university endowments, and foundations. We find (not reported in the table) that the superior performance of endowments overall

¹²The vintage is expressed relative to that of the median LP in the sample, which began its private equity program in 1987. Thus, a program begun in 1991 would be coded as +4.

is predominantly driven by the private universities. The public universities and foundations have positive but not statistically significant coefficients.

In column (2), we include a dummy equal to one if the LP and GP are in the same region of the United States and a control for the age of the private equity program of the LP. We also add several other LP-specific controls, such as the logarithm of the LP size (measured as committed capital) and dummies for the region where the LP is located. We find that the main results described above are not affected by the inclusion of these controls. The relationship between LP size and performance is negative but not significant. However, when we include a squared term for log of size in an unreported regression, we see that the average performance of the funds they invest in is concave. The direct effect of size is positive while the coefficient on the squared term is negative although not statistically significant, i.e., those LPs that are very big tend to underperform the average.¹³

The geographical proximity factor is negatively associated with fund performance, which might suggest that LPs are willing to invest in funds with lower performance if they are in the same local area. In unreported regressions, we also interact the dummy for whether LP and GP are in the same region with the dummies for different

¹³One could imagine that there are severe capacity constraints in the industry, for example, in terms of how much an LP can invest in a given fund and at what pace new fund managers enter. Under this model, larger endowments might be forced to experiment more and invest into new fund managers to secure the future choice of GPs. The need for this type of investment might further depress the performance of large funds, since we know from Kaplan and Schoar (2004) that first-time funds on average underperform the industry.

LP classes and we find that the negative effect is entirely driven by the public pension funds. Only public pension funds display a large negative coefficient on the interaction term. We also differentiate whether LP and GP are in the same region or in the same state. We find that public pension funds continue to display poor performance when investing in funds that are in the same state, while funds in the same broad region of the U.S., but not in the same state, do not underperform. When we disaggregate the endowments as above, there is also a strong negative effect for public universities. These findings are consistent with the idea that public pension funds and public endowments face politically motivated pressures or constraints to invest in their local areas despite possibly unfavorable effects on performance.¹⁴

¹⁴To further investigate the possibility that the objective functions of public institutions may explain their inferior performance relative to, say, private endowments, we also examine the performance of LPs in their out-of-state investments. When making out-of-state investments, public pension funds should not have an objective to invest in underperforming funds. However, we find that these LPs still distinctly underperform private endowments in their out-of-state investments. These findings suggest that public institutions' non-financial motives (or constraints) to support local funds cannot explain the story fully. Banks are another class of LPs whose investment performance could potentially be explained by their different objectives. For example, Hellmann, Lindsey, and Puri (2004) suggest that banks might diverge from maximizing returns on investments in order to obtain future banking income from the portfolio firms. We note, though, that the banks in our sample are LPs and not GPs, which should make it more difficult to build up relationships between the bank and the portfolio companies. Table 2 shows that banks underperform other LP classes not only in the buyout industry (where considerations about future business might be important), but even in their VC investments where their prospects for generating future banking business are not as strong. We also group the banks into those with mainly retail banking businesses and those with relatively important income from corporate banking activities. We find that the latter banks performed slightly worse overall than retail banks, and that this lower performance is almost entirely due to their investments in buyout funds. Retail banks, however, still underperform the other LP classes by a considerable margin. Overall, these results seem to indicate that banks' lower performance may be partly due to their different objectives when investing in private equity funds, but these differences in objective functions do not provide a full explanation for banks' inferior performance in private equity.

The coefficient on LP vintage is positive but insignificant. We then interact the LP class dummies with the vintage of the LP's private equity investment program to find out whether, within the different classes of LPs, those that started investing in private equity earlier display different performance from those that started to invest later. We find negative coefficients on the interaction terms for most LP classes. In particular, among corporate pension funds, those LPs that started investing in private equity earlier have significantly higher IRRs.

4. 4. Importance of Market Cycles

To analyze how sensitive fund returns are to market cycles, in column (4) of Table 3 we replace year fixed effects with a measure of the aggregate annual inflow of capital into the industry. From earlier papers by Gompers and Lerner (1998, 2001) and Kaplan and Schoar (2004) we know that capital flows and returns in private equity are extremely cyclical. Therefore, our measure of industry capital flows can be interpreted as a proxy for the ability of funds to time the market. The coefficient on the aggregate inflow of capital is negative and highly significant.¹⁵ Similar to before, we now interact the LP class dummies with the measure of aggregate capital inflow. Column (5) shows that the coefficient on the interaction term between LP class and aggregate inflow of capital is negative and highly significant in general, but particularly so for advisors (at the 1% level) and for endowments and insurance companies (at the 5% level). These results

¹⁵This pattern continues to hold when we employ other proxies, such as the inflows into venture capital funds only or the level of the NASDAQ. We employ similar alternative controls in subsequent analyses.

suggest that advisors have significantly lower returns if they invest during periods of high capital inflows into the industry. This result is consistent with an interpretation where the latter LPs tend to display more herding behavior when the market is “hot,” which leads to investments in lower return funds.

To test the robustness of this finding we also sort our data into two sub-samples, funds with vintage years from 1991-1994 and those from 1995-1998, and repeat the regressions described in Table 3 (not reported). Consistent with the herding story above, we find that the poor performance of corporate pension funds and banks are predominantly driven by their investments in the 1995-1998 period, which is usually considered the beginning of the bubble period. By way of contrast, endowments show a positive performance difference in both periods. In fact, the private endowments show no difference in performance across the two periods, but the public endowments have a more significant positive performance in the earlier period.

4. 5. Robustness Checks

We replicate the results in Table 3 using excess IRR as the performance measure. Excess IRR is measured as the fund’s own IRR minus the median IRR of all private equity funds in that year and category. These results are reported in the appendix Table 3A. The results are equivalent to the results reported above. We also repeat our analysis for the full sample of LP investments, including those made after 1999 and obtain very similar results. If we replicate the analysis using median regressions or

omitting the top percentile of funds to reduce the importance of extreme values, the results are qualitatively similar.

Lastly, to address concerns about duplicate observations in the sample (if several LPs invest in the same fund), in Table 4 we turn to an alternative empirical approach where we collapse the data at the fund level. We use the number of LPs of each class that invested in a given fund in our sample as explanatory variables for fund performance, together with fund size and controls for year fixed effects and fund category effects. Parallel to before the measures of fund performance are IRR and excess IRR. As in Table 3, we find a significant positive correlation between the performance of a fund and the number of endowments that invest in it. For all other classes of LPs, the coefficient is again negative, but it is only significantly negative for banks and corporate pension funds. Overall these results reconfirm our earlier findings in Table 3.¹⁶

5. Differences in Reinvestment Decisions of LPs

¹⁶Another natural concern is that these results might be driven by salary differentials. To pick two extremes, the endowments of private universities are frequently reputed to be far more generous than state pension funds. The salaries of internal investment staff are not reflected in the stated returns. Could the differential in performance be substantially eroded, once the endowment's higher salaries are factored in? A few illustrative calculations can show that the answer appears to be decisively no, because of the relatively small sizes of these staff. For instance, consider Yale University Investment Office, which had three investment professionals devoted to private equity in 2003. While the salaries of these investment professionals are not revealed in Yale's filings with the Internal Revenue Service, they are less than that paid Dean Takahashi, the office's senior director of investments (\$642,000 in fiscal year 2003). Even if the three were paid the same amount as Takahashi, the salaries would represent only 0.1% of Yale's private equity holdings in that year. Thus, salary differences only account for a tiny fraction of the observed differential in annual performance (Yale's private equity investments exceeded their benchmark by nearly 14% annually between 1992 and 2002 (Lerner, Hardyman, and Leamon (2004))).

In the subsequent analyses, we will try to explain what drives these differences in the performance of LPs. One of the most important decisions for LPs is whether they reinvest in the next fund of a partnership or not. Reinvestment decisions of LPs are particularly important in the private equity industry, where information about the quality of different private equity groups is more difficult to learn and is often restricted to existing investors (see Lerner and Schoar (2004) for a discussion of asymmetric information in private equity). Moreover, LPs have very few governance tools except for exit, *i.e.*, not reinvesting in the next fund.

For each fund in our sample, we identify whether the private equity organization raised a follow-on fund of the same type. For each LP investing in the fund, we then determine whether the same LP reinvested in the follow-on fund. In this way, we make sure that we do not miscode situations where no follow-on fund was raised as a decision not to reinvest.

Panel A of Table 5 shows the reinvestment outcomes by class of LP and fund type. Public pension funds and insurance companies reinvest in roughly 60 percent of the funds where a next fund was raised. They are followed by endowments and advisors, who reinvest in about 50 percent of the cases, while corporate pension funds and banks reinvest in only 39 percent of the cases. Interestingly, endowments and advisors differ in their reinvestment rates across different fund categories. They are more likely to reinvest in venture funds than in buyout funds. Most other LPs do not show a pronounced difference in reinvestment rate across fund categories. Moreover, funds in which

endowments choose to reinvest have much higher average IRR than those of other classes of LPs. Again these higher average IRRs are especially driven by investments in venture capital funds. By way of contrast, the funds that banks and advisors reinvested in show particularly poor performance.

Panel B of Table 5 explores some of the consequences of reinvestment decisions. We find that, across all LP classes, there are significant performance differences between funds in which LPs did and did not reinvest. We see that LPs tend to reinvest in the next fund of the partnership if the current fund has a high IRR (on average these funds have an IRR of 25 percent). In those instances where LPs decided not to reinvest, the current fund on average had a significantly lower IRR of 17 percent. The same pattern holds when we look at the IRRs of the subsequent fund. Funds in which LPs reinvested have significantly higher performance than those in which they did not reinvest (seven versus negative two percent respectively).

In Panel C, we now break out the reinvestment decisions differentiated by class of LP. Interestingly, we see that the difference in the average performance between reinvested and discontinued funds described in Panel B is largely driven by the reinvestment decisions of public and corporate pension funds and advisors, who tend to reinvest when the current fund performance is higher. In contrast, endowments do not show a significant difference in the current performance of partnerships in which they decided to reinvest versus those they did not (39 versus 37 percent). However, this picture reverses when we look at the performance of the next fund. Funds in which

endowments decided to reinvest have much higher performance than those they decided not to (31 versus 7 percent). They appear to be able to select funds that maintain their high performance and avoid those that will have lower performance going forward. Moreover, endowments tend to re-invest when current funds are smaller in size. Public pension funds show a similar ability to differentiate between good and bad performers, but at a much lower average performance level. Funds they reinvested in on average have six percent returns, while those they passed on had negative 2 percent. Advisors also appear to follow a similar approach of reinvesting when the current fund is smaller, but are less successful at picking the better performing next funds. In short, some investors (especially endowments) appear far more able to benefit from and/or act on the inside information that being a limited partner provides.¹⁷

6. Are These Patterns Driven by Fund Access?

One possible explanation is that the superior performance of endowments is an accident of history. As Kaplan and Schoar (2004) document, private equity funds display a concave relationship between fund size and performance: the best funds apparently limit their size, even if they could raise far more capital. Typically, these limitations are implemented by restricting access to existing LPs, who are given the right to reinvest a set amount, and not accepting new investors. These facts may imply that endowments

¹⁷In an unreported analysis, we estimate a linear probability model of reinvestment. Individual fund performance only has a weak impact on the reinvestment decisions. By way of contrast, market cycles have a much more significant effect on reinvestments: in times when more capital flows into the private equity industry, LPs are also more likely to reinvest. LPs tend to be more likely to reinvest if the GP is geographically proximate. Corporate pension funds and endowments are less likely to reinvest on average.

enjoy superior returns not because of better fund selection, but because their early experience gave them a “seat at the table” among superior groups.

To explore the possibility that the results simply reflect superior access, we first analyze recent investment decisions in young private equity groups. In these cases, access to the funds is much less critical: existing LPs should have little preferential access.¹⁸

Table 6 summarizes the performance of different classes of LPs for funds managed by recently established private equity groups. We use the median founding year (1990) of all private equity groups in our sample as a cut-off, and explore whether endowments continue to enjoy superior performance when they invest in the younger private equity groups. We include all funds started after 1990 and prior to 1999, to ensure that the funds had some time to realize returns. In this case we again find that endowments and public pension funds outperform the rest of the sample. However, the differences in performance between the different LPs are less pronounced. But banks (and, to some extent, advisors) still seem to perform worst when we condition on the younger GPs.¹⁹

¹⁸It is possible that existing relationships and prestige of an established limited partner help somewhat in getting access to the hottest new funds, but typically new funds are not in the position of turning away new investors.

¹⁹We also repeat a regression approach along similar lines as Table 3, including only funds established after 1990 and before 1999. Parallel to the descriptive statistics, we find young funds in which banks invest do significantly worse. All LP dummies except for endowments have a negative coefficient relative to the omitted category (public pension funds) but none of these are significant. When we use excess IRR as the dependent variable, endowments have significantly positive performance.

Another way to assess ease of access to funds is to consider the degree of over- or under-subscription that they experience. A fund that is raised at or above its target size is likely to have been in heavy demand by investors, and the GPs could therefore afford to be more selective in terms of who they allow to invest in the fund. On the other hand, a fund that closed below target probably would not have restricted access. We collect data on target size of funds from *The Private Equity Analyst*.

Panel A of Table 7 shows the availability of target close data for our sample. Out of 884 funds (corresponding to 5,802 LP-fund pairs) for which we had target fund size data, 197 were under-subscribed, 112 closed at the target size, and 575 were over-subscribed (it is standard industry practice to state a target size somewhat below one's actual goal). Since over 65% of the funds in our sample were over-subscribed (which is not surprising given the rapid growth of the private equity industry during the 1990s), we are able to obtain only a limited amount of variability along this dimension of our measure of ease of access to funds. As an alternative proxy, we also collect data on the time it took GPs to raise the target amount of capital for their funds. Our assumption is that funds with a longer closing time are less restrictive in granting access to LPs than funds that closed very quickly. Panel B shows that, of the 849 funds (corresponding to 5,605 LP-fund pairs) for which we had data on fundraising speed, 368 took longer than one year to close (we classify these as "slow to raise" funds), and 481 closed within one year (we label these funds "fast to raise"). Panel C shows the results of performance regressions similar to those in Table 3, but where we restrict the sample to only those

funds that were either under-subscribed or closed at their target size,²⁰ and a second sub-sample consisting only of slow to raise funds. We find that endowments still outperform all other LP classes. (The results are similar in unreported univariate comparisons.)

Overall, these results suggest that some of the differences in the performance of LPs (in particular, endowments and public pension funds) might be attributable to preferential access of these LPs that have been in the industry for a long time. Over time, they may have developed good relationships with established and successful GPs in the industry.²¹ However, the results regarding young and under-subscribed funds suggest that more than preferential access is at work.

7. LP-Specific Differences

Our analysis so far has focused on the differences between LP classes. But not all endowment or pension fund investors are equal. Therefore, we now turn to analyzing the importance of the underlying heterogeneity among individual LPs. The analysis that follows will allow us to investigate whether differences in investment styles are systematically related to differences in the performance of LPs.

²⁰Ideally, we would also have liked to conduct this exercise on the sub-sample consisting only of funds that were under-subscribed, however, the number of observations in those regressions would be very low, which would make interpretation of results difficult. Also, note that, for similar reasons, we include all available funds in these regressions (and not just those that closed before 1999).

²¹We note that it might be optimal for established LPs to invest in a number of younger funds even if the expected returns on these funds are initially low. The goal of this strategy could be the need to generate information about new classes of funds (e.g., Chinese venture capital) and to create a pipeline of a new generation of GPs with whom they will have preferential relationships going forward. This in turn could bias our results on the returns of young funds downwards and make the differences between LP classes less pronounced than they might otherwise be.

For that purpose, we estimate a model with LP-specific fixed effects. We augment the standard model we used in Table 3 by adding a full set of LP-specific fixed effects instead of dummies for LP classes. This allows us to test whether individual LPs differ in their intermediary investment styles, e.g., their propensity to invest in younger, larger, or better performing funds. Table 8 reports the results from this exercise for a number of different dependent variables. The first row of this table reports the R^2 of a regression of the raw fund IRR on controls for fund category and vintage year fixed effects. The R^2 in this regression is 28.9%. We now add the dummies for LP classes to this specification. Row 2 shows that the R^2 goes up to 29.7%. Moreover, the F-test for the joint significance of the LP class dummies is significant at the 1% level. When we include the full set of individual LP fixed effects, the R^2 of the regression increases to 35.2%. This increase is much more pronounced relative to the base model than when we included the LP class dummies in row 2. This finding suggests that LP-specific heterogeneity explains a bigger fraction of the overall variation of LP performance than differences between LP classes. We also find that an F-test on the joint significance of the LP fixed effects is significant at the 1% level.

We repeat this analysis using excess IRR as the dependent variable. Similarly to before, we find that R^2 between the base model and the model with LP class dummies increases from 11.7% to 12.7%, but when we include the individual LP fixed effects the R^2 goes up to 19.2%. The same patterns hold for the other dependent variables: GP founding year, GP size, and the change in size between two consecutive funds. In each

case, the increase in R^2 is much larger when including the individual LP fixed effects. Overall, these findings suggest that LP-specific differences in investment styles are more important than differences between LP classes in explaining the variation in LP performance.

A natural question is whether some classes of LPs are more heterogeneous than others. To explore the heterogeneity in LP styles by class of LP, we calculate the mean, median, and standard deviations of the estimated fixed effects by LP class. If the distribution of the estimated fixed effects is very tight around the sample mean, it would suggest that LPs do not vary greatly within LP classes, and *vice versa* if the distribution is very wide. Moreover, we can analyze if there are differences in the distribution across LP class.

The results in Table 9 suggest that the standard deviations of IRR fixed effects for endowments are somewhat larger than the other LPs. Panels A and B show that the standard deviation of the raw IRR and excess IRR fixed effects for endowments are 31 and 23 respectively, higher than for the other LP classes (except the “other” category). However, this could be driven by the positive skewness of fund returns for endowments. Indeed, when we condition on the lower 75% of funds across all LPs, the difference in spreads across the different LP classes is much less apparent (Panels C and D, and Figure 1). The standard deviations are relatively similar across the different LP classes for the other dimensions of LP investment styles.

8. Conclusion

The differences between institutional and individual investors have attracted growing attention by financial economists. The diversity of strategies *across* the various classes of institutional investors, however, has been less scrutinized. This paper examines the experience of various institutional investors in private equity funds.

We document dramatic differences in the performance of investments by different institutions: Endowments have an annual return some 14% better than other institutions, while funds selected by investment advisors and banks perform particularly poorly. These differences remain present when we employ a variety of controls and specifications. We explore the importance of funds' reinvestment strategies in explaining the differences in LP performance. We find that endowments and corporate pension funds are much less likely to reinvest in a given partnership. Moreover, funds in which endowments decided to reinvest show much higher performance going forward than those where endowments decided not to reinvest. This suggests that endowments proactively use the information they gain from being an inside investor, while other LPs seem less willing or able to use information they obtained as an existing fund investor.

We also explore the possibility that the superior performance of endowments results from historical accident: *i.e.*, that these LPs through their early experience as LPs may have greater access to established, high-performing funds. However, when conditioning on young private equity funds (those raised after 1990) and undersubscribed funds, we still find a significant, though smaller gap between endowments and other

investors. While these findings do not support the idea that the superior performance of these LPs is merely driven by historical accident, we cannot rule out that some of the performance difference is due to their early access to superior funds.

Finally, we examine LP-specific differences in the performance and selection of private equity funds by estimating individual LP fixed effects. We show that LPs have persistent differences in their investment returns and the investment strategies they seem to adopt vary widely in terms of the size, age, and geographic location of funds they invest in.

These findings can potentially shed light on some of the previously documented puzzles in the private equity market, see for example Gompers and Lerner (1998) and Kaplan and Schoar (2004). (1) The strong pro-cyclicality of capital flows into the private equity industry seems to be mainly driven by less sophisticated LPs, which subsequently have very poor performance. The entrance (and exit) of these classes of LPs might explain the boom and bust cycles in private equity returns. (2) The presence of uninformed or performance-insensitive LPs allows poorly performing GPs to raise new funds and thus makes exit as a governance mechanism of sophisticated LPs less effective. It also contributes to the persistence of performance in private equity, in particular at the lower end.

This paper poses a number of follow-on questions that would reward further research:

- First, better understanding the sources of the performance puzzle is an important challenge. For instance, what specific agency problems, have led to the poor selection of funds by investment advisors and banks? While we can speculate on some of the causes—the weak incentive compensation offered many advisors and the desire on the part of many banks to attract lending and advisory business by investing in new funds—clearly more work is needed to understand these issues.²²
- Second, we noted in the introduction that the differing experience levels of the LPs might exacerbate cycles in the private equity market. To fully investigate this question, it would be necessary to link the records of LP investments that we have investigated here with the characteristics of the individual companies backed by private equity funds.
- Finally, it would be interesting to explore the generality of these results. We suggested above that the extreme information problems associated with private equity might lead to dramatic differences in this asset class that would not be duplicated elsewhere. Are the same patterns seen, for instance, in the returns from hedge fund and public equity managers? If so, it may be interesting to

²²In exploratory work, we undertook a simple cross-sectional analysis of the performance of private equity investments by university endowments. We find strong correlations between the LP specific fixed effects from IRR regressions and academic ranking measures. In particular, proxies for selectivity from applicant pools and for alumni loyalty exhibit strong correlations with the performance of university endowments, suggesting that the top-performing schools benefit from their close ties to accomplished alumni. We are now in the process of exploring these issues in more depth across asset classes, using data from the National Association of College and University Business Officers.

explore the broader consequences of the changing mixture of institutional investors.

References

- Barber, Brad M., and Terrance Odean, 2003, "All that Glitters: The Effect of Attention and News on the Buying Behavior of Individual and Institutional Investors," Unpublished working paper, University of California at Berkeley and Davis.
- Bennett, James A., Richard W. Sias, and Laura T. Starks, 2003, "Greener Pastures and the Impact of Dynamic Institutional Preferences," *Review of Financial Studies*, 16, 1203-1238.
- Fenn, George W., Nellie Liang, and Stephen Prowse, 1995, *The Economics of the Private Equity Market*, Washington, Board of Governors of the Federal Reserve System.
- Froot, Kenneth, and Melvyn A. Teo, 2004, "Equity Style Returns and Institutional Investor Flows," Working paper no. 10355, National Bureau of Economic Research.
- Gompers, Paul, and Josh Lerner, 1996, "The Use of Covenants: An Analysis of Venture Partnership Agreements," *Journal of Law and Economics*, 39, 463-498.
- Gompers, Paul, and Josh Lerner, 1998, "What Drives Venture Capital Fundraising?," *Brookings Papers on Economic Activity: Microeconomics*, 49-192.
- Gompers, Paul, and Josh Lerner, 1999, "An Analysis of Compensation in the U.S. Venture Capital Partnership," *Journal of Financial Economics*, 51, 3-44.
- Gompers, Paul, and Josh Lerner, 2000, "Money Chasing Deals? The Impact of Fund Inflows on Private Equity Valuations," *Journal of Financial Economics*, 55, 281-325.
- Gompers, Paul, and Josh Lerner, 2001, *The Money of Invention: How Venture Capital Creates New Wealth*, Boston, Harvard Business School Press.
- Gompers, Paul, and Andrew Metrick, 2001, "Institutional Investors and Equity Prices," *Quarterly Journal of Economics*, 116, 229-260.
- Gottschalg, Oliver, Ludovic Phalippou, Maurizio G. Zollo, 2003, "Performance of Private Equity Funds: Another Puzzle?," Working Paper no. 2003/93/SM/ACGRD 3, INSEAD.
- Grinblatt, Mark, Sheridan Titman, and Russ Wermers, 1995, "Momentum Investment Strategies, Portfolio Performance and Herding: A Study of Mutual Fund Behavior," *American Economic Review*, 85, 1088-1105.
- Gromb, Denis, and Dimitri Vayanos, 2002, "Equilibrium and Welfare in Markets with Financially Constrained Arbitrageurs," *Journal of Financial Economics*, 66, 361-407.

Hellmann, Thomas, Laura Lindsey, and Manju Puri, 2004, "Building Relationships Early: Banks in Venture Capital," Unpublished working paper, University of British Columbia, Arizona State University, and Duke University.

Jones, Charles, and Matthew Rhodes-Kropf, 2002, "The Price of Diversifiable Risk in Venture Capital and Private Equity," Unpublished working paper, Columbia Business School.

Kaplan, Steven N., and Antoinette Schoar, 2004, "Private Equity Performance: Returns, Persistence and Capital Flows," *Journal of Finance*, forthcoming.

Lakonishok, Josef, Andrei Shleifer, and Robert W. Vishny, 1992, "The Structure and Performance of the Money Management Industry," *Brookings Papers on Economic Activity: Microeconomics*, 339-379.

Lerner, Josh, G. Felda Hardyman, and Ann Leamon, 2004, *Venture Capital and Private Equity: A Casebook*, New York, John Wiley, 3rd edition.

Lerner, Josh, and Antoinette Schoar 2004, "The Illiquidity Puzzle: Theory and Evidence from Private Equity," *Journal of Financial Economics*, 72, 3-40.

Massa, Massimo, and Ludovic Phalippou, 2004, "Mutual Funds and the Market for Liquidity," Discussion Paper no. 4818, Centre for Economic Policy Research.

Mayer, Colin, Koen Schoors, and Yishay Yafeh, 2003, "Sources of Funds and Investment Activities of Venture Capital Funds: Evidence from Germany, Israel, Japan, and the U.K.," Working paper no. 9645, National Bureau of Economic Research.

Poterba, James, 1989, "Venture Capital and Capital Gains Taxation," in Lawrence Summers, editor, *Tax Policy and the Economy*, Cambridge, MIT Press, volume 3, 47-68.

Shleifer, Andrei, and Robert Vishny, 1997, "The Limits of Arbitrage," *Journal of Finance*, 52, 35-55.

Swensen, David, 2000, *Pioneering Portfolio Management: An Unconventional Approach to Institutional Investment*, New York, Free Press.

Table 1. Descriptive Statistics

Panel A: Descriptive statistics - Funds

	Overall						Early-stage VC funds					
	N	Mean	Std dev	Min	Med	Max	N	Mean	Std dev	Min	Med	Max
Total closing (MM\$)	1,397	407	664	4.5	180	6,100	394	208	242	5.2	125	1,600
Overall fund sequence number	1,392	3.7	3.6	1	3	32	392	3.7	2.7	1	3	14
Closing year	1,397	1997	2.7	1991	1998	2001	394	1998	2.6	1991	1999	2001
Internal rate of return (%)	576	6.7	51.0	-94.2	-3.4	513	159	13.8	79.3	-66.8	-12	513
Pre-1999 funds only	341	23.9	59.1	-94.2	10.5	513	71	60.5	99.6	-66.8	27.9	513
Excess IRR ^a (%)	564	6.5	43.6	-90.5	0	493	156	17.2	67.8	-62.5	-1	493
Pre-1999 funds only	332	11.0	54.9	-90.5	0.8	493.4	69	40.2	96.1	-62.5	6.5	493.4
Carried interest (%)	199	20.7	2.2	20	20	30	58	21.8	3.3	20	20	30
Management fee (%)	115	2.1	0.5	1	2	4	38	2.4	0.5	1	3	4
Number of LPs investing in fund	1,397	5.4	5.7	1	3	46	394	4.9	4.5	1	3	31
Geographical location of US-based funds:												
West	1,117	0.31		0		1	331	0.56		0		1
Northeast	1,117	0.47		0		1	331	0.27		0		1
South	1,117	0.12		0		1	331	0.12		0		1
Midwest	1,117	0.11		0		1	331	0.06		0		1

	Later-stage VC funds						Buyout funds					
	N	Mean	Std dev	Min	Med	Max	N	Mean	Std dev	Min	Med	Max
Total closing (MM\$)	530	328	466	4.5	166	4,600	473	660	953	10	300	6,100
Overall fund sequence number	527	4.2	4.2	1	3	32	473	3.0	3.3	1	2	29
Closing year	530	1997	2.8	1991	1997	2001	473	1997	2.6	1991	1997	2001
Internal rate of return (%)	224	7.6	42.4	-49.9	-0.3	268.4	193	-0.4	21.2	-94.2	-0.6	57.9
Pre-1999 funds only	134	25.6	45.2	-38.8	14.4	268.4	136	3.1	21.8	-94.2	3.1	57.9
Excess IRR ^a (%)	217	5.6	34.5	-78.4	1	249	191	-1.3	19.0	-90.5	-1	46
Pre-1999 funds only	129	9.0	42.8	-78.4	0.6	248.8	134	-2.1	19.8	-90.5	-0.75	45.5
Carried interest (%)	54	20.5	1.8	20	20	30	87	20.2	1.2	20	20	30
Management fee (%)	32	2.1	0.4	1	2	3	45	1.8	0.3	1	2	3
Number of LPs investing in fund	530	5.2	5.4	1	3	33	473	6.2	6.8	1	4	46
Geographical location of US-based funds:												
West	442	0.27		0		1	344	0.11		0		1
Northeast	442	0.50		0		1	344	0.62		0		1
South	442	0.11		0		1	344	0.12		0		1
Midwest	442	0.12		0		1	344	0.15		0		1

^a Excess IRR is internal rate of return minus the median IRR of the portfolio formed for each fund category every year.

Table 1 (continued). Descriptive Statistics

Panel B: Descriptive statistics – Mean characteristics of limited partners, by class of LP

	N	Year of establishment of private equity investment program	Total funds under management ^b (MMS)	Total private equity commitments ^b (MMS)	Percentage committed to VC funds ^b (%)	Percentage committed to buyout funds ^b (%)	Number of funds in which LP invested ^b
Public pension funds	74	1987	24,753	2,212	33%	37%	31.3
Corporate pension funds	72	1986	10,728	635	44	31	10.5
Endowments	100	1985	1,565	200	41	24	14.3
Private endowments	63	1985	1,378	178	44	23	15.1
Public endowments	10	1986	2,207	200	41	21	21.4
Foundations	27	1986	1,783	239	37	26	9.9
Advisors	66	1988	4,811	3,654	43	35	25.3
Insurance companies	32	1983	36,631	1,171	31	32	18.6
Banks and finance companies	30	1983	85,435	671	27	57	19.1
Other investors	43	1989	933	108	57	31	5.7
Overall	417	1986	18,036	1,173	39%	33%	18.2

^b As of 2002 (Source: Asset Alternatives).

Panel C: Fund observations by vintage year and type

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	All years
Early-stage VC funds	8	15	11	24	19	21	44	41	69	102	40	394
Later-stage VC funds	22	20	31	36	49	43	66	69	76	78	40	530
Buyouts funds	8	19	28	41	35	41	72	75	52	68	34	473
Overall	38	54	70	101	103	105	182	185	197	248	114	1,397

Panel D: Availability of fund performance data

	Funds with performance data				All funds			
	All funds	Early-stage VC funds	Later-stage VC funds	Buyout funds	All funds	Early-stage VC funds	Later-stage VC funds	Buyout funds
Total closing (MMS)	584 (836)	292 (294)	431 (574)	1,002 (1,168)	406 (664)	208 (242)	328 (466)	660 (953)
Sequence number	4.1 (3.2)	4.7 (2.9)	4.3 (3.4)	3.3 (3.1)	3.7 (3.6)	3.7 (2.7)	4.2 (4.2)	3.0 (3.3)
Vintage year	1997 (2.8)	1998 (2.8)	1997 (2.9)	1997 (2.6)	1997 (2.7)	1998 (2.6)	1997 (2.8)	1997 (2.6)
Total number of LPs investing in fund	8.0 (6.5)	7.3 (5.4)	7.6 (6.4)	9.0 (7.3)	5.4 (5.7)	4.9 (4.5)	5.2 (5.4)	6.2 (6.8)
Fraction first funds	20%	14%	17%	27%	30%	27%	25%	37%
Fraction second funds	19%	13%	17%	26%	19%	17%	16%	23%
Fraction third funds	15%	12%	16%	16%	15%	13%	16%	15%
Number of observations	576	159	224	193	1,398	395	530	473
<i>% of all funds</i>	<i>41%</i>	<i>40%</i>	<i>42%</i>	<i>41%</i>				

Table 1 (continued). Descriptive Statistics

Panel E: Comparison of average IRR by vintage year between funds in our sample and funds in the Venture Economics database

Vintage year	Our sample ^c		Venture Economics database ^c	
	N	Mean	N	Mean
1991	17	21.2	25	16.9
1992	22	24.6	48	20.4
1993	31	28.5	67	21.4
1994	45	21.4	72	21.4
1995	42	46.7	74	32.8
1996	48	33.6	70	39.7
1997	66	26.0	115	25.4
1998	70	1.7	149	14.5
1999	81	-18.5	165	-11.1
2000	102	-19.6	175	-13.8
2001	52	-15.9	94	-8.5
Overall	576	6.7	1,054	9.1

^c IRR calculations performed as of September 30, 2003 (in our sample, the observation date varies slightly).

Panel A summarizes fund characteristics of 1,397 distinct funds listed by Asset Alternatives according to the type of fund (early-stage VC, later-stage VC, and buyout funds). Excess IRR is internal rate of return minus the median IRR of the portfolio formed for each fund category every year. Geographical location by region follows the U.S. Census classification of states: *West* includes California; *Northeast* includes Massachusetts, New York, Pennsylvania; *South* includes Texas; *Midwest* includes Illinois, Ohio.

Panel B summarizes overall investment characteristics of 417 limited partners (LPs) who invested in those 1,397 funds, presented according to class of LP (public pension fund, corporate pension fund, endowment, etc). Percentage committed to VC funds includes both early-stage and later-stage VC investments. Percentages committed to VC funds and to buyout funds do not add up to 100% because LPs also invest in other types of specialized private equity funds, such as oil, gas and energy, real estate, or venture leasing funds, which are not covered by our analyses.

Panel C shows the distribution of the funds by vintage year.

Panel D shows mean characteristics of funds for which performance data was available, relative to the entire sample. Standard deviations are in parentheses.

Panel E shows a comparison of average IRR for funds in our sample and funds in the Venture Economics database, grouped by vintage years.

Table 2. Mean Fund Characteristics by Class of LP and by Fund Type

	Overall						Early-stage VC funds					
	N	Fund size (MMS)	Fund sequence number	Fund IRR (%)	Weighted fund IRR (%)	Excess IRR (%)	N	Fund size (MMS)	Fund sequence number	Fund IRR (%)	Weighted fund IRR (%)	Excess IRR (%)
Public pension funds	2,317	984	4.8	7.6	2.6	6.4	365	320	4.8	12.1	1.1	15.5
Corporate pension funds	759	826	4.6	5.1	3.1	2.6	141	228	4.4	9.4	3.1	7.5
Endowments	1,433	588	4.7	20.5	16.9	19.1	542	309	4.8	34.6	28.9	33.1
Private endowments	953	613	4.8	20.8	19.1	20.0	379	324	4.8	33.4	30.7	31.5
Public endowments	214	701	4.9	16.2	3.2	16.6	61	344	5.4	30.6	7.6	33.3
Foundations	266	404	4.1	23.9	23.3	18.4	102	233	4.1	44.3	43.4	39.9
Advisors	1,667	782	4.6	-1.8	-3.0	6.3	551	343	4.5	-0.5	-0.6	11.0
Insurance companies	594	542	4.0	5.5	2.1	5.1	148	238	4.3	2.6	-5.3	8.8
Banks and finance companies	573	721	3.5	-3.2	-4.1	-0.7	89	252	3.4	-13.9	-13.2	-2.5
Other investors	244	429	3.7	4.8	5.9	5.7	98	148	2.9	-6.8	-6.5	3.6
Overall	7,587	777	4.5	6.9	3.8	7.9	1,934	299	4.5	12.8	7.7	17.3

	Later-stage VC funds						Buyout funds					
	N	Fund size (MMS)	Fund sequence number	Fund IRR (%)	Weighted fund IRR (%)	Excess IRR (%)	N	Fund size (MMS)	Fund sequence number	Fund IRR (%)	Weighted fund IRR (%)	Excess IRR (%)
Public pension funds	910	593	5.6	10.8	4.7	7.3	1042	1,557	4.0	3.2	1.5	2.1
Corporate pension funds	260	376	5.5	10.9	8.1	4.3	358	1,389	3.9	0.3	0.3	-0.1
Endowments	493	465	5.4	19.3	15.3	16.0	398	1,118	3.8	0.1	0.5	2.0
Private endowments	307	482	5.6	19.2	17.4	17.2	267	1,174	3.9	2.1	2.4	4.7
Public endowments	91	517	5.5	17.1	4.8	14.1	62	1,324	3.5	-5.0	-5.4	-1.7
Foundations	95	361	4.6	22.2	20.6	14.1	69	717	3.4	-2.1	-0.3	-4.3
Advisors	601	680	5.5	-1.0	-3.8	7.8	515	1,370	3.7	-4.3	-4.5	-1.0
Insurance companies	218	443	4.6	12.3	7.9	8.0	228	835	3.2	-0.6	0.7	-1.2
Banks and finance companies	177	444	3.8	1.0	-0.4	2.0	307	1,017	3.3	-2.2	-3.3	-1.4
Other investors	86	480	5.4	17.8	20.2	11.9	60	815	2.6	-2.3	-2.3	-0.1
Overall	2,745	544	5.3	9.4	5.2	8.8	2,908	1,314	3.7	0.4	-0.3	0.8

The table shows groupings of 7,587 investments by 417 LPs in 1,397 funds, and mean values of selected characteristics of those funds. *Fund size* refers to the total dollar value raised from all investors in the fund, *fund sequence number* is by reference to the private equity firm's funds portfolio, *fund IRR* is the internal rate of return of the fund obtained from *Private Equity Performance Monitor*, and *weighted fund IRR* is internal rate of return weighted by commitment to a fund as a fraction of each LP's total commitments to private equity funds.

Table 3. Fund Performance Regressions

Dependent variable: Fund IRR					
	(1)	(2)	(3)	(4)	(5)
Dummy for LP class:					
(comparison category is public pension funds)					
Corporate pension funds	-6.59 ** (2.83)	-7.83 ** (3.70)	-10.99 *** (4.16)	-9.93 *** (3.75)	-7.40 (6.01)
Endowments	11.58 *** (4.37)	9.07 ** (4.25)	9.34 ** (4.32)	9.81 ** (4.39)	25.01 *** (8.15)
Advisors	2.92 (2.85)	2.94 (5.11)	3.65 (5.72)	1.85 (5.41)	26.52 ** (10.64)
Insurance companies	-5.65 (3.89)	-3.44 (4.33)	-3.95 (4.64)	-4.95 (4.59)	7.41 (8.59)
Banks	-9.05 *** (2.96)	-4.92 (4.49)	-1.09 (6.20)	-5.81 (4.49)	-11.23 (9.29)
Other LPs	-7.90 (5.03)	-31.33 *** (9.98)	-28.07 *** (7.01)	-27.62 ** (10.97)	-40.77 ** (15.63)
LP and GP in same region		-7.35 *** (2.38)	-7.13 *** (2.38)	-6.81 *** (2.33)	-6.31 *** (2.30)
LP vintage		0.35 (0.22)	0.85 ** (0.43)	0.30 (0.24)	0.71 (0.43)
LP size (log of total commitments to private equity)		-0.80 (0.70)	-0.42 (0.73)	-0.84 (0.78)	-0.39 (0.79)
Total private equity fund inflow				-31.55 *** (6.69)	-23.05 *** (6.43)
Interaction effects:					
Corporate pension funds * LP vintage			-1.60 ** (0.72)		-0.99 (0.65)
Endowments * LP vintage			-0.71 (0.61)		-0.46 (0.61)
Advisors * LP vintage			-0.23 (0.83)		-0.07 (0.83)
Insurance companies * LP vintage			-0.68 (0.82)		-0.86 (0.86)
Banks * LP vintage			0.84 (1.55)		-0.69 (1.29)
Other LPs * LP vintage			-1.27 (1.39)		-2.26 (1.53)
Corporate pension funds * inflow					-8.05 (10.60)
Endowments * inflow					-30.50 ** (12.45)
Advisors * inflow					-48.23 *** (15.57)
Insurance companies * inflow					-28.28 ** (13.93)
Banks * inflow					9.63 (13.16)
Other LPs * inflow					38.49 (24.64)
Year fixed effects	Yes	Yes	Yes	No	No
Fund category fixed effects	Yes	Yes	Yes	Yes	Yes
LP region dummies	No	Yes	Yes	Yes	Yes
R-squared	26.9%	23.5%	23.8%	20.9%	22.0%
Number of observations	2,755	1,582	1,582	1,531	1,531

Table 3 (continued). Fund Performance Regressions

The sample consists of investments by 417 LPs in 1,397 funds as compiled by Asset Alternatives, and excludes funds closed in 1999 and after. Several versions of the following pooled regression are run and coefficient estimates and standard errors are reported by columns in the table:

$$\text{FundIRR}_{ij} = \beta_0 + \sum_j \beta_{0j} \text{DummyLP}_j + \sum_j \beta_{1j} \text{DummyLP}_j \times \text{FundInflow}_i \\ + \sum_k \beta_{2k} \text{DummyLP}_k \times \text{LPvintage}_j + \beta_3 D_sameregion_{ij} + \text{controls}$$

FundIRR_{ij} is the internal rate of return of fund i in %. Six dummy variables identify the class of LP for each LP-fund pair, with $\text{DummyLP}_k = 1$ for each observation consisting of an investment in fund i by LP j belonging to LP class k and = 0 otherwise. “Public pension funds” is the ‘base LP class’, with zero values for all LP dummy variables. FundInflow_i is the year-on-year change in the amount of funds inflow into venture capital in the country and in the year of closing of fund i , and is a proxy for market conditions. LPvintage_j is the year of establishment of the private equity program at LP j relative to that of the median LP in the sample, which began its private equity program in 1987. $D_sameregion_{ij}$ is a dummy variable and = 1 if both LP j and private equity firm managing fund i are headquartered in the same region in the U.S. (Midwest (includes Illinois and Ohio), Northeast (includes Massachusetts, New York and Pennsylvania), South (includes Texas), and West (includes California)), and = 0 otherwise. Robust standard errors allowing for data clustering by funds in all the regressions are shown in brackets below the coefficient estimate. Intercepts are not reported.

***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

**Table 4. Fund Performance Regressions
(using individual funds as observations)**

Dependent variable:	Fund IRR (1)	Fund IRR (2)	Fund IRR (3)	Excess IRR (4)	Excess IRR (5)	Excess IRR (6)
Number of public pension funds investing in fund	0.32 (1.31)	-0.10 (1.28)	-0.25 (1.26)	-0.90 (1.24)	-0.86 (1.21)	-1.24 (1.23)
Number of corporate pension funds	-5.51 * (2.85)	-5.68 ** (2.76)	-5.61 ** (2.82)	-3.37 (2.84)	-3.35 (2.73)	-4.40 (2.81)
Number of endowments	3.88 *** (1.28)	4.02 *** (1.24)	4.15 *** (1.26)	5.36 *** (1.22)	5.40 *** (1.18)	5.10 *** (1.19)
Number of advisors	1.00 (2.13)	2.10 (2.10)	1.00 (1.98)	2.05 (1.90)	2.32 (1.84)	3.22 * (1.93)
Number of insurance companies	-4.13 (3.69)	-2.51 (3.60)	-1.79 (3.63)	-3.53 (3.69)	-2.20 (3.57)	-1.97 (3.56)
Number of banks	-6.74 * (3.83)	-5.81 (3.80)	-6.87 * (3.81)	-7.60 ** (3.76)	-6.70 * (3.70)	-6.68 * (3.69)
Number of other classes of investors	-5.14 (7.45)	-8.90 (7.28)	-8.85 (7.36)	-9.05 (7.60)	-12.70 * (7.42)	-11.92 (7.41)
Log(size of fund)	4.51 (4.12)	7.68 * (4.28)	8.19 * (4.29)	-0.04 (3.39)	3.04 (3.61)	4.85 (3.78)
Average vintage of LPs that invest in fund		1.47 (0.90)	1.26 (0.90)		1.03 (0.88)	0.99 (0.88)
Average total private equity commitments of LPs that invest in fund		-0.21 ** (0.11)	-0.19 * (0.11)		-0.19 * (0.10)	-0.19 * (0.10)
Total inflows into private equity			-32.79 *** (10.73)			-16.78 (10.72)
Year fixed effects	Yes	Yes	No	No	No	No
Fund category effects	Yes	Yes	Yes	No	No	No
Adjusted R-squared	20.0%	21.2%	18.5%	6.6%	7.9%	8.3%
Number of observations	324	309	309	316	301	301

The sample consists of 324 funds that were closed prior to 1999 and for which data is available to run the following ordinary least squares regressions:

$$\text{FundPerformance}_i = \beta_0 + \sum_k \beta_{1k} \text{NumLP}_{ik} + \beta_2 \log(\text{FundSize}_i) + \text{controls}$$

Fund performance is measured in two ways: (1) internal rates of return for individual funds, obtained from *Private Equity Performance Monitor*, (2) excess IRR, calculated by subtracting from each fund's IRR the median IRR of the portfolio formed that year and in that category. NumLP_{ik} is the number of LPs of class k that invested in fund i . FundSize_i is the total closing amount for fund i in MM\$.

***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 5. Reinvestment Decisions by LPs

Panel A: Reinvestments by fund category and by class of LP

	Overall					Early-stage VC funds				
	N	Reinvested (Yes=1; No=0)	Next fund size (MM\$)	Change in size, current to next fund (%)	Next fund IRR (%)	N	Reinvested (Yes=1; No=0)	Next fund size (MM\$)	Change in size, current to next fund (%)	Next fund IRR (%)
Public pension funds	976	0.61	1,330	100	2.5	202	0.54	378	106.4	7.6
Corporate pension funds	346	0.38	1,181	96	0.6	88	0.36	344	100.8	11.8
Endowments	777	0.48	808	95	18.7	346	0.54	405	102.5	35.8
Advisors	671	0.48	1,041	103	-8.7	250	0.51	460	117.5	-7.3
Insurance companies	227	0.58	781	100	-1.3	86	0.66	323	101.4	-6.1
Banks and finance companies	197	0.40	1,053	108	-9.2	25	0.48	362	120.9	-17.7
Other investors	90	0.34	654	144	-5.8	37	0.35	220	188.4	-26.4
Overall	3,284	0.51	1,059	101	2.6	1,034	0.52	393	110.2	10.8

	Later-stage VC funds					Buyout funds				
	N	Reinvested (Yes=1; No=0)	Next fund size (MM\$)	Change in size, current to next fund (%)	Next fund IRR (%)	N	Reinvested (Yes=1; No=0)	Next fund size (MM\$)	Change in size, current to next fund (%)	Next fund IRR (%)
Public pension funds	315	0.65	765	96.4	4.4	459	0.60	2,137	100.2	-1.2
Corporate pension funds	93	0.39	649	113.9	0.0	165	0.39	1,927	84.0	-4.5
Endowments	264	0.48	613	82.1	11.9	167	0.35	1,953	101.4	-2.5
Advisors	258	0.54	924	106.7	-12.8	163	0.34	2,117	75.0	-3.2
Insurance companies	75	0.61	663	91.9	2.6	66	0.42	1,512	106.0	-0.3
Banks and finance companies	60	0.40	588	96.5	-15.0	112	0.38	1,457	111.1	-4.6
Other investors	33	0.48	520	125.9	8.3	20	0.10	1,676	92.4	-3.9
Overall	1,098	0.54	732	97.5	0.7	1,152	0.46	1,968	95.8	-2.4

Panel B: Consequences of reinvestment decisions

		LPs re- invested	LPs did not re-invest	Test p-value
Current fund IRR (%)	Mean	24.8	16.9	0.002 ***
	Median	11.2	3.4	<0.001 ***
Current fund excess IRR (%)	Mean	16.0	12.1	0.088 *
	Median	3.5	1.6	<0.001 ***
Next fund IRR (%)	Mean	6.9	-2.2	<0.001 ***
	Median	-7.0	-12.2	0.001 ***
Next fund excess IRR (%)	Mean	13.6	7.7	0.003 ***
	Median	1.6	-0.3	0.001 ***
Size of current fund (MM\$)	Mean	565	676	<0.001 ***
	Median	275	311	0.007 ***
Percent change, current to next fund size	Mean	+106%	+95%	0.005 ***
	Median	+90%	+84%	<0.001 ***

Table 5 (continued). Reinvestment Decisions by LPs

Panel C: Consequences of reinvestment decisions by class of LP

		Mean fund IRR	Mean excess IRR	Mean next fund IRR	Mean next excess IRR	Mean size of current fund	Mean change in size, current to next fund
		(%)	(%)	(%)	(%)	(MMS)	(%)
Public pension funds	Reinvested	+22.9%	+13.1%	+5.6%	+10.7%	764	+112%
	Did not reinvest	+15.8%	+7.4%	-2.4%	+5.5%	812	+82%
	t-test	0.076 *	0.105	0.021 **	0.065 *	0.444	<0.001 ***
Corporate pension funds	Reinvested	17.3	8.3	-0.6	5.4	681	105
	Did not reinvest	9.1	0.7	1.4	6.8	796	91
	t-test	0.117	0.071 *	0.692	0.734	0.281	0.153
Endowments	Reinvested	39.3	25.8	30.5	31.4	336	94
	Did not reinvest	36.6	30.6	7.1	16.7	528	96
	t-test	0.709	0.438	0.001 ***	0.017 **	<0.001 ***	0.736
Advisors	Reinvested	20.6	17.6	-7.8	7.1	527	111
	Did not reinvest	6.0	9.8	-9.7	5.3	743	96
	t-test	0.013 **	0.110	0.675	0.644	<0.001 ***	0.150
Insurance companies	Reinvested	21.7	13.3	1.7	10.4	366	104
	Did not reinvest	14.1	6.1	-6.8	3.3	444	93
	t-test	0.437	0.386	0.288	0.261	0.299	0.269
Banks and finance companies	Reinvested	4.2	0.4	-6.9	0.1	568	112
	Did not reinvest	2.3	-1.6	-10.6	-0.6	639	105
	t-test	0.698	0.644	0.294	0.817	0.564	0.644
Other investors	Reinvested	39.3	24.7	6.8	16.1	239	94
	Did not reinvest	2.2	-0.4	-14.7	1.1	414	171
	t-test	0.001 ***	0.046 **	0.044 **	0.076 *	0.171	0.189

The sample consists of 3,284 reinvestment opportunities identified by reference to the sequence number of funds within the same fund family. Each reinvestment opportunity is coded 1 if the LP reinvested and 0 if investment in the follow-on fund was “discontinued.”

***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 6. Recent Investments in Young Private Equity Groups

	Overall			Early-stage VC funds			Later-stage VC funds			Buyout funds		
	N	Fund IRR (%)	Weighted IRR (%)	N	Fund IRR (%)	Weighted IRR (%)	N	Fund IRR (%)	Weighted IRR (%)	N	Fund IRR (%)	Weighted IRR (%)
Public pension funds	281	8.2	4.4	18	22.5	5.5	83	23.6	16.4	180	-0.3	-1.3
Corporate pension funds	98	6.8	6.7	7	28.2	27.6	27	27.2	26.5	64	-4.2	-3.9
Endowments	134	14.6	13.1	14	2.6	-1.2	50	38.6	34.5	70	-0.1	0.6
Advisors	145	7.3	5.2	10	20.3	19.3	59	20.4	13.8	76	-4.6	-3.4
Insurance companies	58	4.0	2.7	6	3.9	6.4	18	21.3	18.0	34	-5.2	-6.1
Banks and finance companies	72	-0.2	-0.4	3	7.1	7.1	21	5.5	5.3	48	-3.1	-3.3
Other investors	17	-1.3	-1.3	1	-3.8	-3.8	7	6.8	6.8	9	-7.4	-7.3
Overall	805	7.7	5.6	59	15.0	8.9	265	24.0	19.3	481	-2.2	-2.4

The table shows 805 investments for which fund performance data was available by 226 LPs in 118 funds closed prior to 1999 and managed by 90 “young” private equity groups (i.e. established after 1990), as compiled by Asset Alternatives. *Fund IRR* is the internal rate of return of each fund obtained from *Private Equity Performance Monitor*, and *weighted fund IRR* is *fund IRR* weighted by proportional commitment to the fund in each LP’s private equity portfolio.

Table 7. Investments in Over/Under-subscribed and Fast/Slow to Raise Funds

Panel A: Over/under-subscribed funds

	Funds	LP-fund pairs
Undersubscribed (total closing < target close)	197	666
Just subscribed (total closing = target close)	112	670
Oversubscribed (total closing > target close)	575	4,466
Total observations with non-missing data	884	5,802

Panel B: Fast/slow to raise funds

	Funds	LP-fund pairs
Slow to raise (% raised in first year < 100%)	368	2,224
Fast to raise (fully raised within first year)	481	3,381
Total observations with non-missing data	849	5,605
Total sample	1,397	7,567

Table 7 (continued). Investments in Over/Under-subscribed and Fast/Slow to Raise Funds

Panel C: Fund performance regressions for sub-samples consisting of under-subscribed and just subscribed funds, and slow to raise funds

Dependent variable: Fund IRR	Sub-sample consisting of undersubscribed and just subscribed funds			Sub-sample consisting of slow to raise funds		
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy for LP class:						
(comparison category is insurance companies)						
Corporate pension funds	-2.04 (4.36)	-4.26 (5.82)	-8.08 (6.07)	-4.26 (5.75)	-3.70 (7.36)	-2.67 (7.95)
Endowments	15.11 *** (5.62)	11.13 ** (5.07)	11.38 ** (5.09)	16.42 * (9.23)	7.15 (5.44)	7.78 (5.29)
Advisors	1.94 (3.22)	0.38 (4.49)	0.53 (4.53)	-0.03 (3.63)	2.98 (6.43)	3.55 (6.83)
Insurance companies	-0.51 (4.03)	-0.60 (4.45)	-1.69 (4.57)	-8.45 (5.72)	-6.16 (6.60)	-7.33 (6.93)
Banks	-12.86 * (7.19)	-11.23 (11.91)	-7.65 (10.74)	-12.12 ** (5.43)	-11.01 (7.27)	-11.76 (8.88)
Other LPs	-10.93 (12.81)	-44.17 (29.37)	-27.37 (18.63)	-9.65 (6.69)	-17.95 * (10.08)	-17.18 * (9.72)
LP and GP in same region		-0.56 (2.83)	-0.71 (3.15)		-8.67 ** (3.84)	-8.55 ** (3.87)
LP vintage		-0.13 (0.26)	-0.10 (0.35)		0.56 (0.45)	1.28 (0.86)
LP size (log of total commitments to private equity)		-0.41 (0.89)	-0.44 (0.99)		0.78 (0.91)	1.37 (0.95)
Interaction effects:						
Corporate pension funds * LP vintage			-1.05 (0.72)			-0.49 (0.99)
Endowments * LP vintage			0.09 (0.67)			-1.01 (1.07)
Advisors * LP vintage			-0.39 (0.59)			-0.48 (1.13)
Insurance companies * LP vintage			0.42 (0.66)			-2.01 (1.28)
Banks * LP vintage			3.19 ** (1.23)			-1.11 (1.73)
Other LPs * LP vintage			-6.84 * (4.01)			-2.33 (1.76)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Fund category fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
LP region dummies	No	Yes	Yes	No	Yes	Yes
R-squared	54.1%	50.4%	51.1%	25.6%	19.9%	20.2%
Number of observations	795	432	432	1,360	782	782

Panel A shows the number of funds in the sample for which over/under-subscription data was available from *The Private Equity Analyst*.

Panel B shows the number of funds in the sample for which data on time taken for the fund to be raised was available from *The Private Equity Analyst*.

Panel C shows regression results following the specifications in Table 3, for sub-samples consisting of under-subscribed and just subscribed funds, and slow to raise funds.

Table 8. LP Class and Individual LP Effects in Regressions of Fund Performance and Other Portfolio Characteristics

		F-tests on fixed effects for:		N	Adjusted R-squared
		LP class	Individual LPs		
Fund IRR	Row 1			4,618	28.9%
	Row 2	3.64 (.002, 6) ***		4,618	29.7%
	Row 3		274 (<.001, 297) ***	4,618	35.2%
Excess IRR	Row 1			4,514	11.7%
	Row 2	3.28 (.004, 6) ***		4,514	12.7%
	Row 3		482 (<.001, 295) ***	4,514	19.2%
GP founding year	Row 1			7,080	3.1%
	Row 2	5.96 (<.001, 6) ***		7,080	4.0%
	Row 3		453 (<.001, 361) ***	7,080	15.8%
GP size	Row 1			7,115	13.8%
	Row 2	28.11 (<.001, 6) ***		7,115	17.5%
	Row 3		1,686 (<.001, 361) ***	7,115	32.9%
Percentage change in fund size between consecutive investments with same GP	Row 1			3,284	1.9%
	Row 2	1.05 (.392, 6)		3,284	2.6%
	Row 3		1,633 (<.001, 265) ***	3,284	25.4%

The sample consists of investments by 417 LPs in 1,397 funds as compiled by Asset Alternatives. Reported in the table are the results from fixed effects panel regressions, where standard errors are clustered at the fund level. For each dependent variable (as reported in column 1), the fixed effects included are:

Row 1: fund category and vintage year fixed effects;

Row 2: fund category, vintage year, and LP class fixed effects;

Row 3: fund category, vintage year, and individual LP fixed effects.

Reported are the F-tests for the joint significance of the LP class fixed effects (column 2), and individual LP fixed effects (column 3). For each F-test, we report the value of the F-statistic, the p-value and the number of constraints. Column 5 reports the number of observations and column 6 the adjusted R² for each regression.

***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

**Table 9. Dispersion of Estimated Fixed Effects
from LP Fixed Effects Regressions, by Class of LP**

	Panel A:			Panel B:		
	Fund IRR			Excess IRR		
	Mean	Median	Std dev	Mean	Median	Std dev
Public pension funds	7.0	12.3	24.1	13.9	11.6	14.8
Corporate pension funds	-1.7	3.2	27.2	14.5	13.7	9.5
Endowments	21.4	23.6	31.4	29.9	26.3	22.9
Advisors	10.0	20.0	27.6	18.3	21.3	12.1
Insurance companies	7.9	5.7	22.0	13.8	10.9	13.3
Banks and finance companies	-5.7	-0.1	29.4	12.5	12.8	7.7
Other investors	0.7	7.7	38.3	15.3	6.5	23.0
Overall	8.4	12.0	29.1	18.6	16.1	17.7

	Panel C:			Panel D:		
	Fund IRR, using lower 75% of funds across all LPs			Excess IRR, using lower 75% of funds across all LPs		
	Mean	Median	Std dev	Mean	Median	Std dev
Public pension funds	0.10	-4.58	14.31	4.63	6.34	10.04
Corporate pension funds	-0.53	-3.97	14.93	6.02	6.19	8.17
Endowments	-1.58	-5.95	14.10	9.24	8.59	7.89
Advisors	-7.77	-8.42	15.33	7.84	9.40	12.34
Insurance companies	0.48	-2.10	14.27	4.59	5.55	7.45
Banks and finance companies	-1.90	-5.45	14.38	6.42	5.23	6.23
Other investors	-7.75	-8.05	12.97	0.76	-0.23	5.76
Overall	-2.00	-5.92	14.54	6.35	6.85	9.18

	Panel E:			Panel F:		
	Change in fund size			GP founding year		
	Mean	Median	Std dev	Mean	Median	Std dev
Public pension funds	0.24	0.29	0.70	2.81	3.34	9.74
Corporate pension funds	0.22	0.30	0.72	1.04	2.10	11.67
Endowments	0.32	0.57	0.74	-2.01	-0.91	11.63
Advisors	0.50	0.74	0.71	0.39	2.81	12.94
Insurance companies	0.46	0.70	0.75	-1.88	-5.49	10.25
Banks and finance companies	0.22	0.56	0.85	-1.53	-3.39	10.09
Other investors	0.80	0.38	1.29	0.87	0.54	11.16
Overall	0.35	0.47	0.79	0.22	0.72	11.21

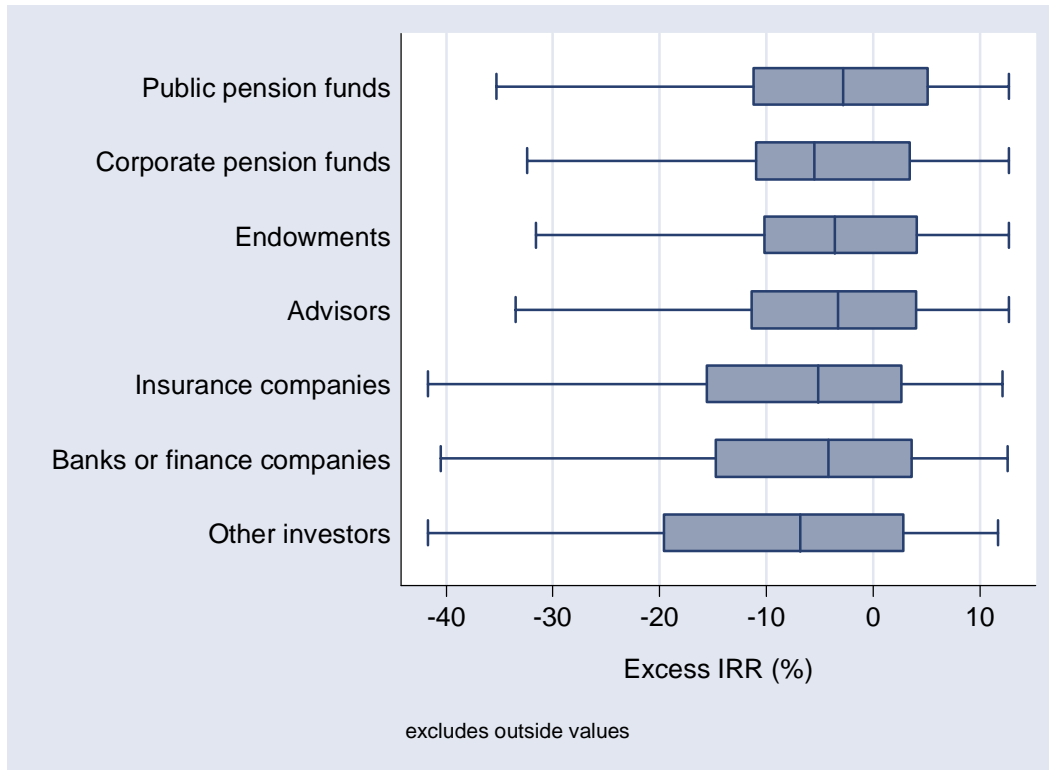
Table 9 (continued). Dispersion of Estimated Fixed Effects from LP Fixed Effects Regressions, by Class of LP

	Panel G:			Panel H:		
	GP size (log of total capital managed)			Reinvested in next fund (Yes = 1, No = 0)		
	Mean	Median	Std dev	Mean	Median	Std dev
Public pension funds	0.42	0.70	1.39	-0.021	-0.033	0.59
Corporate pension funds	0.56	0.88	1.28	-0.070	0.024	0.64
Endowments	0.62	0.96	1.19	0.054	0.244	0.56
Advisors	0.63	0.98	1.27	0.175	0.254	0.50
Insurance companies	-0.19	-0.21	1.08	-0.060	0.050	0.66
Banks and finance companies	-0.27	0.16	1.53	0.011	0.144	0.56
Other investors	-0.35	-0.30	1.70	-0.071	0.003	0.50
Overall	0.35	0.70	1.36	0.004	0.059	0.58

	Panel I:			Panel J:		
	Fraction of GPs located in same region			Average number of funds managed per GP		
	Mean	Median	Std dev	Mean	Median	Std dev
Public pension funds	-0.48	-0.58	0.38	0.51	0.38	0.48
Corporate pension funds	-0.40	-0.51	0.44	0.30	0.25	0.27
Endowments	-0.38	-0.47	0.41	0.43	0.32	0.45
Advisors	-0.53	-0.58	0.37	0.22	0.17	0.21
Insurance companies	-0.49	-0.49	0.29	0.39	0.20	0.75
Banks and finance companies	-0.19	-0.38	0.53	0.25	0.12	0.35
Other investors	-0.38	-0.51	0.55	0.15	0.00	0.31
Overall	-0.42	-0.50	0.42	0.36	0.25	0.44

The table shows the mean, median, and standard deviation of the LP fixed effects, grouped by LP class, from separate regressions of fund IRR, excess IRR, change in size between successive funds, GP founding year, GP size, reinvestment decisions, fraction of GPs located in same region as the LP, and average number of funds managed per GP in each LP's portfolio on LP dummies, LP vintage, dummies for the region of the LP and for the co-location of the LP and GP, fund vintage years, and fund categories.

Figure 1. Box Plot of Excess IRR by Class of LP, Conditioned on Lower 75% of Funds across all LPs



The graph shows the relative distribution of excess IRR when conditioned on the lower 75% of funds across all LPs, grouped by LP class. The line in the middle of the shaded box indicates the median, the left and right edges of the box are the 25th and 75th percentiles respectively, and the ends of the line indicate adjacent values of the distribution of LP-specific excess IRR fixed effects for each class of LP. Outside values (extreme outliers) are not shown in the plot.

APPENDIX

Table 3A. Fund Performance Regressions Using Excess IRR as Dependent Variable

Dependent variable: Excess IRR	(1)	(2)	(3)	(4)	(5)
Dummy for investor type: (comparison category is public pension funds)					
Corporate pension funds	-4.77 *	-8.62 **	-11.45 ***	-10.25 ***	-9.63
	(2.61)	(3.65)	(4.22)	(3.70)	(6.24)
Endowments	21.70 ***	15.72 ***	15.47 ***	16.63 ***	26.69 ***
	(6.83)	(4.56)	(4.49)	(4.71)	(8.38)
Advisors	7.63 **	11.35 **	11.14 **	11.51 **	27.90 ***
	(3.40)	(4.92)	(5.52)	(4.86)	(10.14)
Insurance companies	-0.57	2.09	1.10	0.85	12.68
	(3.73)	(4.37)	(4.67)	(4.50)	(9.24)
Banks	-9.11 ***	-3.55	-2.08	-4.17	-10.19
	(2.88)	(3.84)	(6.29)	(3.83)	(7.78)
Other LPs	-2.51	-39.36 ***	-39.26 ***	-37.02 ***	-53.89 ***
	(5.20)	(8.93)	(8.22)	(9.78)	(9.32)
LP vintage		0.26	-8.64 ***	0.34	0.87 *
		(0.23)	(2.55)	(0.24)	(0.46)
LP and GP in same region		-8.90 ***	0.89 *	-8.75 ***	-8.34 ***
		(2.57)	(0.45)	(2.57)	(2.52)
Total private equity fund inflow			-1.10	-13.56 **	-7.28
			(0.75)	(6.04)	(5.67)
LP size (log of total commitments to private equity)		-1.42 *		-1.13	-0.86
		(0.78)		(0.78)	(0.75)
Interaction effects:					
Corporate pension funds * LP vintage			-1.55 **		-1.01
			(0.72)		(0.69)
Endowments * LP vintage			-0.98		-0.83
			(0.65)		(0.66)
Advisors * LP vintage			-0.67		-0.57
			(0.88)		(0.87)
Insurance companies * LP vintage			-1.00		-0.70
			(0.69)		(0.79)
Banks * LP vintage			-0.03		-0.62
			(1.46)		(1.16)
Other LPs * LP vintage			-0.60		-1.23 *
			(0.76)		(0.69)
Corporate pension funds * inflow					-4.00
					(9.35)
Endowments * inflow					-21.66 *
					(12.57)
Advisors * inflow					-33.75 **
					(14.52)
Insurance companies * inflow					-27.00 **
					(13.65)
Banks * inflow					11.67
					(10.37)
Other LPs * inflow					36.91 ***
					(8.71)
Year fixed effects	No	No	No	No	No
Fund category fixed effects	No	No	No	No	No
LP region dummies	No	Yes	Yes	Yes	Yes
R-squared	3.9%	5.2%	5.6%	5.9%	6.8%
Number of observations	2,684	1,541	1,541	1,491	1,491

**Table 3A (continued). Fund Performance Regressions
Using Excess IRR as Dependent Variable**

The sample consists of investments by 417 LPs in 1,397 funds as compiled by Asset Alternatives, and excludes funds closed in 1999 and after. Several versions of the following pooled regression are run and coefficient estimates and standard errors are reported by columns in the table:

$$\text{ExcessIRR}_{ij} = \beta_0 + \sum_j \beta_{0j} \text{DummyLP}_j + \sum_j \beta_{1j} \text{DummyLP}_j \times \text{FundInflow}_i \\ + \sum_k \beta_{2k} \text{DummyLP}_k \times \text{LPvintage}_j + \beta_3 \text{D_sameregion}_{ij} + \text{controls}$$

ExcessIRR_{ij} is the internal rate of return of fund *i* in % minus the median IRR of the portfolio formed for each fund category every year. Six dummy variables identify the class of LP for each LP-fund pair, with *DummyLP_k* = 1 for each observation consisting of an investment in fund *i* by LP *j* belonging to LP class *k* and = 0 otherwise. “Public pension funds” is the ‘base LP class’, with zero values for all LP dummy variables. *FundInflow_i* is the year-on-year change in the amount of funds inflow into venture capital in the country and in the year of closing of fund *i*, and is a proxy for market conditions. *LPvintage_j* is the year of establishment of the private equity program at LP *j* relative to that of the median LP in the sample, which began its private equity program in 1987. *D_sameregion_{ij}* is a dummy variable and = 1 if both LP *j* and private equity firm managing fund *i* are headquartered in the same region in the U.S. (Midwest (includes Illinois and Ohio), Northeast (includes Massachusetts, New York and Pennsylvania), South (includes Texas), and West (includes California)), and = 0 otherwise. Robust standard errors allowing for data clustering by funds in all the regressions are shown in brackets below the coefficient estimate. Intercepts are not reported.

***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively.