Smart Institutions, Foolish Choices:

The Limited Partner Performance Puzzle

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ABSTRACT

The returns that institutional investors realize from private equity differ dramatically. Using detailed, hitherto unexplored records, we document large heterogeneity in the performance of investor classes: endowments' annual returns are nearly 21% greater than average. Analysis of reinvestment decisions suggests that endowments (and to a lesser extent, public pensions) are better than other investors at predicting whether follow-on funds will have high returns. The results are not primarily due to endowments' greater access to established funds, since they also hold for young or undersubscribed funds. Our results suggest that investors vary in their sophistication and potentially their investment objectives.

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Over the past three decades, institutional investors have controlled an increasing share of the U.S. equity markets with their share of U.S. public equity markets exceeding the 50% threshold in 1995 (Gompers and Metrick (2001)).[1] A significant and growing literature in financial economics seeks to understand the investment decisions of institutional investors and the differences between institutions and other classes of investors, especially individual investors. Gompers and Metrick (2001) document, for example, that institutional investors hold stocks that have greater market capitalization, are more liquid, have higher book-to-market ratios, and realize lower returns in the prior year.[2]

A question that has attracted much less scrutiny, however, is the extent to which there exists heterogeneity in the 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 portfolios or the resources available to them, there are also systematic differences across institutions in terms of 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 portfolio allocation decisions and, ultimately, investment returns.[3]

In this paper, we analyze whether there exist systematic differences in the returns and investment strategies across institutional investors, focusing on one asset class, private equity. Since it is generally believed that the private equity market is characterized by greater information asymmetries than public markets, differences among institutions should be most pronounced here. We analyze investment styles and

performance across several different classes of institutional investors, known as limited partners (LPs), e.g., banks, corporate and public pension funds, endowments, advisors, insurance companies.

Numerous accounts by both objective observers and practitioners suggest that there is substantial variation in the investment criteria and sophistication of private equity investors. For instance, the manager of a large endowment highlights the advantages that private university endowments enjoy because of their greater flexibility to evaluate nonstandard investment opportunities (Swensen (2000)):

> [Endowments] on the cutting edge choose from a broader opportunity set. [. . .]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.

Swensen's description, echoed in our conversations with other industry observers, suggests that endowments have greater flexibility in selecting investments. Other institutions, it is suggested, often rely on overly rigid decision criteria or lack a sufficient understanding of the asset class. Observers attribute these failures to several underlying factors: (1) inappropriate incentives, for example, the limited compensation and autonomy that public pension investment officers enjoy, which leads to frequent turnover, and the rewards from maximizing assets under management that advisors receive, even if they lead to deteriorating returns); (2) poor human resource practices, for example, the rapid rotation of personnel in corporate pension funds; and (3) conflicting objectives (see below). We anticipate that the deleterious effects of such distortions should be most dramatic for those cases for which it is most difficult to assess

performance, namely, venture capital, where the progress of the companies in the funds' portfolios is very difficult to assess from traditional accounting data.

Using detailed, hitherto unexplored records of the portfolio composition and performance of funds that different classes of LPs invest in, we document dramatic differences in returns across classes of LPs. The average returns of private equity funds that endowments invest in are nearly 21% greater than those of the average LP in our sample. Funds selected by banks lag sharply. These differences in performance hold even if we control for observable characteristics such as vintage year and type of the fund, which have been shown to be important in prior studies (see, for example, Gompers and Lerner (1998, 2000) and Kaplan and Schoar (2005)). We also find that across the different groups, older LPs tend to realize better performance than newer LPs, which indicates that LPs' investment decisions may improve with experience. Overall, these results suggest that LPs differ in their ability to evaluate the quality of funds and to invest based on this information, that is, in their level of sophistication.

To understand whether differences in sophistication can explain these performance differences, we analyze reinvestment decisions across LP classes. The decision to reinvest in the next fund of a general partner (GP) is the central means by which LPs can adjust their portfolio, make use of inside information obtained during the investment process, and exert governance pressure on the GP, since private equity is a very illiquid asset class (investors have little recourse to their investment once the capital has been committed). We find that follow-on funds in which endowments (and to a lesser extent, public pension funds) decide to reinvest observe much higher performance than those funds in which they decide not to reinvest, suggesting that these LPs are better

at forecasting the performance of follow-on funds. Other LP classes do not demonstrate these performance patterns. 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.

Second, to understand whether LPs also differ in their ability to act on public information, we examine investments in young private equity groups (those established after 1990). If performance differences are driven mainly by the superior access of established LPs to older private equity groups, conditioning on younger GPs should eliminate the performance difference. We again find a performance premium for endowments and public pension funds, though the difference is smaller than in the analysis using all GPs.

There are a number of alternative explanations for the observed heterogeneity in performance other than differences in sophistication. First, LPs might differ in the risk profile of the funds 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, in which case the performance differentials may be due simply to historical accident: Through their early experience as LPs, endowments 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, and 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 conduct a type of value-at-risk analysis, where for each class of LPs we calculate the likelihood that the internal rate of return (IRR) of a fund falls below a certain cutoff level. If, indeed, endowments achieve their superior returns by taking on riskier investments, we should expect that they have a higher likelihood of having funds in the lowest performance quartiles. However, we do not find any evidence that supports the idea that endowments achieve their superior performance by relying on riskier investment strategies.[4]

Second, the concern that performance differences across LPs could be, at least in part, the result of differences in the objectives of LPs should be most important for banks and public pension funds. For example, banks might diverge from maximizing returns on investments in order to obtain future banking income from the portfolio firms. However, we find that banks underperform the other LPs not only in the buyout industry, where considerations about future business might be important, but even in venture capital (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 political obligations to invest in in-state funds in an effort to support the local economy even if doing so reduces return on investment. We therefore compare the performance of in-state funds across LPs and find that, indeed, public pension funds underperform other LPs in their in-state funds. However, this does not fully explain the 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. In addition, we want to rule out the possibility that top performing GPs try to "upgrade" their investor base and allow preferential access to endowments that are considered prestigious LPs.[5] To address these concerns, we construct two variables that proxy for the ease of access to a fund; namely, an indicator as to whether a fund was oversubscribed, and 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 the returns for endowments and other types of LPs on investments in both undersubscribed funds and funds that take a long time to close, 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.

This paper is related to the literature on the decision to invest in and the performance of private equity funds. Poterba (1989) and Gompers and Lerner (1998)

explore how tax and other public policies affect 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 both the targeted investments and the limited partners. Mayer, Schoors, and Yafeh (2003) analyze the sources of VC financing across countries and how these are correlated with investment choices. Kaplan and Schoar (2005) study how the level of returns affects the ability of private equity groups to raise follow-on funds. The paper closest to our own is probably that of Gottschalg, Phalippou, and Zollo (2003), who highlight the puzzlingly low performance of private equity funds raised between 1980 and 1995. To date, however, the drivers and consequences of the decisions by individual LPs to invest in private equity funds have been hitherto unexplored.

The organization of this paper is as follows. Section I summarizes the data used in the analysis. Section II presents the analysis of performance differences across LP classes. Section III examines reinvestment decisions, and Section IV addresses some of the alternative interpretations of our findings such as differences in risk profiles, objective functions, and access to funds. Finally, Section V concludes the paper.

I. The Data

Before describing the dataset, we briefly discuss the nature of private equity investing. The bulk of institutional investment in private equity is effected through separate funds run by professional managers (the GPs). The selection of appropriate direct investments requires resources and specialized human capital 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 LPs) and the principals (the GPs) in the fund. The agreement 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 previous fund nears completion.

In the remainder of this section, we describe the data sources we employ in this paper. Note that the greater disclosure of private equity investments in recent years has allows us to undertake this study.

Investment decisions. To ascertain which institutional investors invest in which private equity funds, we employ two sources. Our primary source is Asset Alternatives' compilation of private equity investors. Since 1992, Asset Alternatives has compiled data on 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 have not been made hitherto available to researchers. While the database is not comprehensive, it covers a large and diverse fraction of the private equity industry. Our second source comes from the investors themselves. Numerous public pension funds disclose the funds in which they invest. We obtain this information from annual reports or through written request from the LPs directly. In addition, a number of private investors with whom the authors have personal relationships provided us confidential listings of their investments. We obtain detailed information about these portfolio allocations from 20 different institutional investors.

Fund characteristics. We collect information on the fund's size and 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*, which, again, has not been shared previously with researchers), supplemented by Venture Economics'(VE) online funds database. We distinguish between the overall count of the fund and its sequence within a particular family of funds. In total, our database covers 838 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. Our primary source for return data is 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, Freedom of Information Act requests to public funds, and voluntary disclosures by both GPs and LPs.[6] Private Equity Intelligence makes its own assessment of the reliability of the different sources of performance data available (that is, 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 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-check and supplement the Private Equity Intelligence data with the return data that we gather from public sources. Note that we only use in our analysis funds established prior to 1999, since this performance metric is unlikely to be very meaningful

for younger funds.[7] (In unreported analyses, we verify the results for a sample of funds raised prior to 2002.) IRRs are reported net of fees and carried interest.

A potential problem with using IRR is that it is a nonlinear 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 analyses in our paper using two alternative measures of fund performance,, (a) the value of actual distributions received by the LPs (expressed as a multiple of the fund's committed capital), and (b) the stated value of the fund plus the value of all distributions (again expressed as a multiple of committed capital). All the results are unchanged. We also find that the correlations between the three different performance measures are very high, between 75% and 98%.[8]

Institutional investor characteristics. We compile 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 of Private Equity Investors* and Asset Alternatives' *Directory of Alternative Investment Sources.*

II. Analysis of Performance Differences

In this section, we begin by presenting some descriptive statistics about the dataset we describe above. We then turn to presenting the central puzzle: The dramatic difference in returns across classes of LPs. We also consider in this section the impact of market cycles and the robustness of the results.

A. Descriptive Statistics

Table I presents descriptive statistics of the 838 funds in our sample of funds raised between 1991 and 1998 and the 352 LPs in these funds. Panel A of Table I shows statistics of the funds, broken down into three categories: Early-stage VC, later-stage VC, and buyout funds.

[Table I about here]

Fund Characteristics. The average fund in our sample is $313 million, but there is large heterogeneity across funds. The smallest fund is $4.5 million, while the largest is $6 billion. Not surprisingly, buyout funds are much larger, with an average size of $564 million. The average fund is a fourth fund (the average sequence number is 3.6), but again there is substantial variation. The funds in our sample are concentrated on the East and West coasts, with 50% and 27% of the sample funds, respectively. The average performance for all funds in the sample is 24%; excess returns,, that is, the fund's return net of the median IRR of the funds formed in that category and year, average 11%. This performance is comparable in magnitude to (but a little higher than) the average performance found in Gompers and Lerner (2001), Kaplan and Schoar (2005), and Jones and Rhodes-Kropf (2002).[9] Early- and later-stage VC funds in our sample have significantly higher performance than the buyout funds, at 60% and 25% versus 3%, respectively (on an unadjusted basis).

Composition of Limited Partners. Panel B of Table I describes the distribution of LPs in our sample and their characteristics. Endowments comprise the largest group, with 87 LPs, followed by public pension and corporate pension funds (66 each). When we differentiate among the different subclasses of endowments, we find that the majority

of the endowments in our sample are private university endowments (55), followed by foundations (23) and public university endowments (9). There are 48 advisors in the sample, 29 insurance companies, 23 commercial and investment banks, and 33 LPs that cannot be classified in any of the above categories (among such LPs are investment agencies of foreign governments, venture capital departments of large corporations, and religious organizations.) We also collect data on 17 of the 23 banks in our sample of LPs in order to group them into those with mainly retail banking businesses (10 banks) and those with relatively important income from corporate banking activities (7 banks). Advisors and public pension funds contribute the largest amounts of capital committed to the industry overall (averaging $3.6 billion and $2.3 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 for which 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 and the Venture Economics universe of funds with the same vintage years. IRR data are

available for just over 40% of all funds in the sample across the various fund categories. 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 find that the annual average IRRs in our sample are slightly higher than the corresponding IRRs in the Venture Economics database, however, the differences are not statistically significant (except for 1998, the most recent year in our sample). Moreover, the directions of the annual changes in performance in our sample are parallel to the VE data. While the average IRR might be slightly higher than in the VE sample, the more important question is whether there are *differential* biases among the LP classes. Given the way we construct our dataset, it is difficult to believe that LPs selectively report their investments to Asset Alternatives since the latter collect their data from GPs and LPs alike and, in fact, their database does not include any performance measures. Thus, at the time of reporting the investments, the institutions could not have anticipated that we would be able to match performance data to their investments. Similarly, it is difficult to believe that the better performance of endowments is solely driven by selection bias, since we capture a larger fraction of endowments in our sample than of the other classes of LPs. Nonetheless, we also run sample selection regressions below to address this potential issue.

B. Performance Differences across LP Classes

Table II provides an overview of the investments made by each LP class, showing the different fund categories separately. There is enormous heterogeneity in the

performance of funds in which different classes of institutions invest. The funds that endowments invest in have by far the best overall performance, with an average IRR of 44%. This high performance is entirely driven, however, by endowments' VC investments. On average, early- and later-stage VC funds that endowments invest in return an IRR of 95% and 36%, respectively. In contrast, the buyout investments of endowments only have an IRR of 2%. 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.

[Table II about here]

The picture looks quite different for public pension funds and advisors (and to some extent, insurance companies). On average, the funds that these classes of LPs invest in have more moderate IRRs (20% and 23%, respectively), but the drivers of the positive returns are less skewed towards VCs, especially in the case of public pension funds. Finally, we see that the funds picked by corporate pension funds and especially banks have very poor performance on average (IRRs of 13% and 4%, respectively). This trend seems to hold across all different types of private equity investments. Note that we must be somewhat cautious in interpreting these findings, since this calculation does not reflect the actual size of the allocations to each of the different funds. Rather, this exercise represents the ability of different groups of LPs to identify (good) funds on average.[11]

Table II also reveals that public and corporate pension funds tend to invest in larger funds, whereas endowments and insurance companies invest in smaller funds. 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 than average. We find that insurance companies and banks tend to invest in early funds (lower sequence numbers) across all fund categories.

C. Regression Analysis

A natural question to ask is whether these univariate results are robust to controlling for the time period during which the investments were made, or the choice between VC and buyout funds. For these and subsequent analyses, we analyze investments at the LP-fund level, that is, we 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.

In Table III, 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. Column (2) shows that these results are virtually unchanged if

we include year fixed effects in the regression. Thus, the results are not driven simply by the timing of investments. To understand the difference in the performance of endowments in more detail, we also replicate this regression such that we distinguish between private university endowments, public university endowments, and foundations. In untabulated results, we find that the superior performance of endowments overall is predominantly driven by the private universities. The public universities and foundations have positive but statistically insignificant coefficients.

[Table III about here]

In column (3), we include controls for whether the LP and GP are in the same region of the United States and 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 in which the LP is located. We find that most of the main results described above are not affected by the inclusion of these controls. However, the negative coefficient on the bank dummy becomes smaller and statistically insignificant.[13]

The coefficient on LP vintage is positive but insignificant. We interact the LP class dummies with the vintage of the LP's private equity investment program to understand if those LPs 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.

D. Importance of Market Cycles

To analyze how sensitive fund returns are to market cycles, in column (5) of Table III 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, 2000) and Kaplan and Schoar (2005), 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.[14] As before, we interact the LP class dummies with the measure of aggregate capital inflow. Column (6) 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, endowments, and insurance companies. These LPs have significantly lower returns if they invest during periods of high capital inflows into the industry, which is consistent with investor herding behavior when the market is "hot." Interestingly, even endowments do not seem to be exempt from this effect.

E. Additional Robustness Checks

We replicate the results in Table III 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 Table A.1 of the Appendix. The results are equivalent to the results reported above. We also repeat our analysis for all funds that we can identify that were raised between 1991 and 2001 (1,397 funds in total) and obtain very similar results.

To address the concern that a few lucky LPs drive the returns of the different LP classes, we undertake two unreported analyses. First, we calculate median instead of mean performance for the different LP classes. We find that the endowments still significantly outperform the rest of the LPs, but the estimated coefficient is much smaller (only about 9% instead of 21%). This is not surprising since the distribution of private equity returns is highly positively skewed. We also rerun our regressions on LP performance excluding the 1% of funds with the highest IRRs. This allows us to get rid of some of the truly lucky draws that LPs might have had without eliminating the entire positive tail of the return distribution. When we run these regressions, we find that endowments again significantly outperform all other LP classes, while banks and corporate pension funds underperform. Overall this suggests that endowments consistently realize better performance than other LPs, and this difference is not driven simply by a few lucky investments.[15]

Another concern is that the missing returns data may vary in a systematic manner. For instance, as noted above, returns data were more likely to be missing for smaller funds. If banks were more adept at investing in small funds, it might be that their level of

underperformance was less than what appeared in the reported regressions. To address this concern, we run a Heckit sample selection regression, as reported in column (7) of Table III (see, for example, Carhart, Carpenter, Lynch, and Musto (2002)). The results are virtually unchanged.[16]

Lastly, to address concerns about multiple observations in the sample (typically several LPs invest in the same fund), we turn to an alternative empirical approach whereby we collapse the data at the fund level (Appendix Table A.2). We use the number of LPs of each class that invest 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. The results from this exercise reconfirm our earlier findings in Table III.[17]

III. Differences in Reinvestment Decisions of LPs

In the subsequent analyses, we try to explain what drives the above 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 obtain and is often restricted to existing investors (see Lerner and Schoar (2004) for a discussion of asymmetric information in private equity).

For each fund in our sample, we identify whether the private equity organization raises a follow-on fund of the same type. For each LP investing in the fund, we then determine whether the same LP reinvests in the follow-on fund. In this way, we make

sure that we do not miscode situations in which no follow-on fund was raised as a decision not to reinvest. Panel A of Table IV shows the reinvestment outcomes by class of LP and fund type. Public pension funds and insurance companies are most likely to reinvest in the next fund of a given partnership (59% and 54%, respectively). They are followed by endowments and advisors, who reinvest about 50% of the time when presented with reinvestment opportunities, while the likelihood of corporate pension funds and banks reinvesting is only 39%. 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 pronounced differences in reinvestment rates across fund categories. Moreover, funds in which endowments have an opportunity to reinvest have a much higher average IRR than those of other classes of LPs. Again, these higher average IRRs are driven especially by VC funds. By way of contrast, the funds that banks and corporate pension funds can reinvest in show particularly poor performance.

[Table IV about here]

Panel B of Table IV explores some of the consequences of LPs' reinvestment decisions. We find that, across all LP classes, there are significant performance differences between funds in which LPs do and do not reinvest. We see that, overall, LPs tend to reinvest in the next fund of the partnership if the current fund has a high IRR. In those instances in which LPs decide not to reinvest, on average the IRR of the current fund is significantly lower (on the order of 9%). The same pattern holds when we look at the IRRs of the subsequent fund. Funds in which LPs reinvest have significantly higher performance than those in which they do not reinvest (14% versus 3%, respectively). In

the first seven rows of Panel B of Table IV,, we break out the reinvestment decisions by class of LP. Interestingly, we see that public pension funds, advisors, and insurance companies tend to reinvest when *current* fund performance is higher. In contrast, there is no significant difference in the current performance of partnerships in which endowments decide to reinvest versus those in which they do not (50% versus 54%). However, this picture reverses when we look at the performance of the next fund. Funds in which endowments (and to a lesser degree, public pension funds) decide to reinvest have much higher performance than those in which they decide not to reinvest (43% versus 17%). 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 reinvest 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. 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.[18]

IV. Alternative Explanations

A. Differences in Risk Profiles

As previously mentioned, there are a number of alternative 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 enjoy higher

returns. To address this concern, 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, and 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, in Table V we also conduct a type of value-at-risk analysis, whereby we calculate for each class of LPs the likelihood that the IRR of a fund is negative, falls below 20%, or falls into the lowest quartile, the lowest half, or the lowest three quartiles of funds ranked by performance. If endowments achieve their superior returns by taking on riskier investments, we should expect that they have a higher likelihood of having funds in the lowest performance quartiles. However, no matter which threshold we use, we see that endowments are not more likely to be investing in poorly performing funds. These results do not support the idea that endowments achieve their superior performance by relying on riskier investment strategies.[19]

[Table V about here]

B. Differences in Objective Functions

Most practitioners believe that the two classes of LPs that are most likely to diverge from a pure return maximization objective are 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. The cross-selling of services to the portfolio companies of the fund might justify accepting a lower return on the initial LP investment. For instance, many

banks generate substantial profits from lending to firms undergoing leveraged buyouts or 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 is expected to increase the probability that they will generate substantial fee income from the group's transactions.[20]

This alternative explanation receives only limited support. First, Table II 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. Second, we address this question by collecting data on the fraction of revenues the different banks make from M&A and corporate lending activities. If the inferior returns of banks are purely driven by differences in their objective function, the lower performance should be most pronounced in banks that stand to gain a lot from those activities. We group the banks in our sample into those with mainly retail banking businesses and those with relatively important income from corporate banking activities. The tabulation in Table II shows that the latter banks perform slightly worse overall than retail banks, and that this lower performance is due to their investments in later-stage VC and buyout funds. This lends some support to the idea that banks' lower performance may be partly due to their different objectives when investing in private equity funds, but this is unlikely to be the full explanation, since the retail banks still underperform the other LP classes by a large margin across all fund categories.

A second set of LPs that might diverge from a pure return motive are public pension funds, which often face obligations to invest in in-state funds in an effort to support the local economy. We therefore compare the performance of in-state funds

across LPs and find that, indeed, public pension funds underperform other LPs in their in-state funds. In unreported regressions along the lines of Table III, we interact the dummy for whether LP and GP are in the same region with the dummies for different LP classes and find that the negative effect is entirely driven by the public pension funds. Only public pension funds display a large negative coefficient in 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.

However, we do not believe that differences in the objective function fully explain the lower performance of public pension funds relative to private endowments. When we concentrate only on the performance of public pensions in their out-of-state investments, we find that these LPs still distinctly underperform private endowments in their out-of-state investments. However, when making out-of-state investments, public pension funds should not have an objective to invest in underperforming funds. These findings suggest that public institutions' nonfinancial motives (or constraints) to support local funds cannot explain the story fully.

C. Are These Patterns Driven by Fund Access?

Another possible explanation for the patterns documented in Section II is that the superior performance of endowments is an accident of history. As Kaplan and Schoar (2005) 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 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.[21]

Table VI 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 cutoff, and explore whether endowments continue to enjoy superior performance when they invest in the younger private equity groups. In this case, we again find that endowments and public pension funds outperform the rest of the sample. However, the differences in performance across the different LPs are less pronounced. Note that banks (and, to some extent, advisors) still seem to perform worst when we condition on the younger GPs.[22]

[Table VI about here]

Another way to assess ease of access to funds is to consider the degree of over- or undersubscription that the funds experience. A fund that is at or above its target size is likely to have been in heavy demand by investors, and the GPs could therefore have afforded to be more selective in terms of who they allowed 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 the target size of funds from *The Private Equity Analyst*.

Panel A of Table VII shows the availability of target close data for our sample. Out of 507 funds (corresponding to 3,435 LP-fund pairs) for which we have target fund size data, 103 were undersubscribed, 48 closed at the target size, and 356 were over-subscribed (it is standard industry practice to state a target size somewhat below one's actual goal). Since over 70% of the funds in our sample were oversubscribed (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 close very quickly. Panel B shows that, of the 471 funds (corresponding to 3,246 LP-fund pairs) for which we have data on fundraising speed, 245 took longer than one year to close (we classify these as "slow-to-raise" funds), and 226 closed within one year (we label these as "fast-to-raise" funds). Panel C shows the results of performance regressions similar to those in Table III, but where we restrict the sample to (1) only those funds that either were undersubscribed or closed at their target size,[23] and (2) a second subsample

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.)

[Table VII here]

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 those LPs that have been investing in the industry for a long time. Over time, they may have developed good relationships with established and successful GPs in the industry.[24] However, the results regarding young and undersubscribed funds suggest that more than preferential access is at work.

V. Conclusion

While the differences between institutional and individual investors have attracted growing attention by financial economists, the diversity of performance and investment strategies *across* the various classes of institutional investors 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 realize an annual return that is approximately 21% better than that of other institutions, while funds selected by banks perform particularly poorly. These differences remain present when we employ a variety of controls and specifications. Moreover, funds in which endowments decide to reinvest show much higher performance going forward than those in which endowments decide not to reinvest. This suggests that endowments proactively use the private information they

gain from being an inside investor, while other LPs seem less willing or able to use information they obtain as an existing fund investor.

We also explore the possibility that the superior performance of endowments can be explained in alternative ways. First, we show that the funds selected by endowments seem no riskier than those chosen by other limited partners. Second, we show that differing objectives explain only a portion of the difference between limited partners; for instance, the inferior performance of public pensions cannot be entirely explained by the lower returns garnered by in-state investments. Finally, we examine whether,, through their early experience as LPs, endowments may have greater access to established, high-performing funds. When conditioning on young private equity funds (those raised after 1990), undersubscribed funds, and slow-to-raise funds, we still find a significant gap between endowments and other investors.

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 (2005). The presence of unsophisticated or performance-insensitive LPs allows poorly performing GPs to raise new funds and thus makes exit less effective as a governance mechanism of sophisticated LPs. Unsophisticated LPs also contribute to the persistence of performance in private equity, in particular at the lower end.

This paper poses a number of interesting follow-on questions that we leave for 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 poorer selection of funds by corporate pensions, investment advisors, and banks? While we can speculate on some of the weaknesses of certain institutional investors, such as weak

incentive compensation for many investment advisors and the frequent rotation of employees in corporate pension staffs, but clearly more work is needed to understand these issues.

Second, it would be interesting to explore the generality of our results. We suggest above that the extreme information problems associated with assessing the companies in venture capitalists' portfolios are what have led to the dramatic disparities in the performance of venture capital investments across investors. These extreme information gaps may or may not be duplicated in other asset classes. Do the same patterns arise, for instance, in the returns of hedge fund and public equity managers? If so, it may be interesting to explore the broader consequences of the changing mixture of institutional investors.

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Table I
Descriptive Statistics

This table presents descriptive statistics for the sample of 838 funds raised between 1991 and 1998 and the 352 limited partners who invested in these funds, as compiled by Asset Alternatives.

Panel A summarizes fund characteristics of 838 distinct funds raised between 1991 and 1998 according to the type of fund (early-stage VC, later-stage VC, and buyout funds). *Excess IRR* is the 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 the overall investment characteristics as of 2002 of 352 limited partners (LPs) who invested in those 838 funds, split into different LP classes (public pension funds, corporate pension funds, endowments, 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 frequency distribution of the 838 funds by vintage year, split into early-stage VC, later-stage VC, and buyout funds.

Panel D shows mean characteristics of 341 out of the 838 funds for which performance data are available from *Private Equity Performance Monitor*, compared to the entire sample of funds closed between 1991 and 1998. Standard deviations are in parentheses below the means.

Panel E shows a comparison of average IRR for funds in our sample and funds in the Venture Economics database, grouped by vintage years. Cumulative IRRs since inception are calculated as of September 2003 (in our sample, the observation date varies slightly).

Table I (continued)
Descriptive Statistics

Panel A: Descriptive statistics - Funds

Internal rate of return (%)	341	23.9	59.1	-94.2	10.5	513	71	60.5	99.6	-66.8	27.9	513
Excess IRR (%)	332	11.0	54.9	-90.5	0.8	493	69	40.2	96.1	-62.5	6.5	493
Number of LPs investing in fund	838	5.5	5.9	1	3	46	183	4.8	4.0	1	4	18
Geographical location of U.S.-based funds:												
West	672	0.27		0		1	160	0.55		0		1
Northeast	672	0.50		0		1	160	0.27		0		1
South	672	0.12		0		1	160	0.12		0		1
Midwest	672	0.11		0		1	160	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$)	336	196	248	4.5	122	1,850	319	564	833	10	253	6,000
Overall fund sequence number	333	4.2	4.3	1	3	32	319	2.9	3.2	1	2	28
Closing year	336	1995	2.2	1991	1996	1998	319	1996	2.0	1991	1996	1998
Internal rate of return (%)	134	25.6	45.2	-38.8	14.4	268.4	136	3.1	21.8	-94.2	3.1	57.9
Excess IRR (%)	129	9.0	42.8	-78.4	0.6	248.8	134	-2.1	19.8	-90.5	-0.75	45.5
Number of LPs investing in fund	336	5.1	5.5	1	3	33	319	6.4	7.1	1	4	46
Geographical location of U.S.-based funds:												
West	273	0.24		0		1	239	0.12		0		1
Northeast	273	0.52		0		1	239	0.63		0		1
South	273	0.11		0		1	239	0.12		0		1
Midwest	273	0.13		0		1	239	0.13		0		1

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 (MM$)	Total private equity commitments (MM$)	Percentage committed to VC funds (%)	Percentage committed to buyout funds (%)	Number of funds in which LP invested
Public pension funds	66	1986	26,380	2,320	33%	37%	34.9
Corporate pension funds	66	1986	11,731	652	47	31	11.4
Endowments	87	1985	1,698	206	43	23	16.2
Advisors	48	1986	4,811	3,654	43	35	32.8
Insurance companies	29	1982	33,711	1,198	33	32	20.3
Banks and finance companies	23	1984	92,513	655	27	60	23.9
Other investors	33	1989	1,236	155	43	39	6.8
Overall	352	1986	19,167	1,253	39%	33%	21.0

Table I (continued)
Descriptive Statistics

Panel C: Frequency Distribution of Fund Observations by Vintage Year and Type

	1991	1992	1993	1994	1995	1996	1997	1998	All years
Early-stage VC funds	8	15	11	24	19	21	44	41	183
Later-stage VC funds	22	20	31	36	49	43	66	69	336
Buyouts funds	8	19	28	41	35	41	72	75	319
Overall	38	54	70	101	103	105	182	185	838

Panel D: Availability of Fund Performance Data

	All funds with performance data in sample, 1991-1998				All funds in sample, 1991-1998				Venture Economics universe, 1991-1998		
	All funds	Early-stage VC funds	Later-stage VC funds	Buyout funds	All funds	Early-stage VC funds	Later-stage VC funds	Buyout funds	All funds	VC funds	Buyout funds
Total closing (MM$)	435	117	222	812	313	88	196	564	139	69	331
	(700)	(72)	(217)	(971)	(574)	(65)	(248)	(833)	(350)	(164)	(580)
Sequence number	3.7	4.3	4.2	3.0	3.6	3.4	4.2	2.9	3.7	3.8	3.5
	(2.9)	(2.3)	(2.9)	(3.0)	(3.6)	(2.1)	(4.3)	(3.2)	(4.5)	(4.8)	(3.6)
Vintage year	1995	1995	1995	1996	1996	1996	1995	1996	1996	1996	1995
	(2.1)	(2.2)	(2.2)	(2.0)	(2.1)	(2.1)	(2.2)	(2.0)	(2.1)	(2.1)	(2.2)
Total number of LPs investing in fund	8.1	6.7	7.8	9.1	5.5	4.8	5.1	6.4			
	(6.8)	(4.6)	(6.7)	(7.6)	(5.9)	(4.0)	(5.5)	(7.1)			
Fraction first funds	18%	11%	15%	26%	26%	20%	22%	35%	37%	37%	36%
Fraction second funds	22%	11%	17%	32%	21%	19%	17%	27%	17%	17%	19%
Fraction third funds	18%	20%	18%	16%	18%	20%	17%	16%	10%	9%	12%
Number of observations	341	71	134	136	838	183	336	319	4,418	3,386	1,032
% of all funds in the sample	*41%*	*39%*	*40%*	*43%*							

Table I (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	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
Overall	341	23.9	620	23.7

Table II
Mean Fund Characteristics by Class of LP and by Fund Type

The table shows groupings of 4,618 investments by 352 LPs in 838 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* refers to the private equity firm's portfolio of funds managed, *fund IRR* is the internal rate of return of the fund reported by *Private Equity Performance Monitor* as of September 2003, *weighted fund IRR* is the internal rate of return weighted by each LP's commitment to the fund as a proportion of its total commitments to private equity funds, and *excess IRR* is the internal rate of return minus the median IRR of the portfolio formed for each fund category every year.

	Overall						Early-stage VC funds					
	N	Fund size (MM$)	Fund sequence number	Fund IRR (%)	Weighted fund IRR (%)	Excess IRR (%)	N	Fund size (MM$)	Fund sequence number	Fund IRR (%)	Weighted fund IRR (%)	Excess IRR (%)
Public pension funds	1,483	814	4.6	20.2	12.6	8.9	171	129	4.3	57.9	31.2	37.3
Corporate pension funds	572	740	4.2	13.5	12.0	4.1	89	110	3.8	36.9	33.5	15.7
Endowments	923	465	4.7	44.3	38.7	30.6	294	129	4.4	95.4	83.9	69.1
Private endowments	*597*	*494*	*4.8*	*46.1*	*43.1*	*32.7*	*203*	*131*	*4.6*	*92.3*	*86.6*	*65.9*
Public endowments	*129*	*478*	*4.8*	*40.1*	*20.2*	*27.7*	*28*	*135*	*4.7*	*97.8*	*50.2*	*74.3*
Foundations	*197*	*369*	*4.0*	*42.6*	*41.1*	*26.3*	*63*	*120*	*3.9*	*106.4*	*103.5*	*78.3*
Advisors	732	716	4.5	23.8	21.2	16.5	166	130	4.0	69.7	66.1	51.2
Insurance companies	385	429	3.7	20.1	15.0	8.3	85	102	3.6	47.2	32.4	27.7
Banks and finance companies	363	699	3.4	4.3	3.0	-0.2	31	106	3.3	17.3	14.1	2.8
Mainly retail banking	*214*	*673*	*3.5*	*6.0*	*4.2*	*2.3*	*23*	*103*	*3.1*	*11.5*	*8.1*	*1.4*
Substantial corporate segment	*90*	*1,003*	*3.3*	*-3.1*	*-3.1*	*-5.6*	*4*	*114*	*3.5*	*67.5*	*67.5*	*40.5*
Indeterminate bank type	*59*	*330*	*3.0*	*9.9*	*8.9*	*-2.4*	*4*	*113*	*4.0*	*21.0*	*17.8*	*-9.5*
Other investors	160	315	3.8	14.5	16.2	6.3	48	69	3.1	15.8	16.8	2.9
Overall	4,618	661	4.4	23.7	18.8	13.3	884	121	4.1	68.9	56.0	47.0

	Later-stage VC funds						Buyout funds					
	N	Fund size (MM$)	Fund sequence number	Fund IRR (%)	Weighted fund IRR (%)	Excess IRR (%)	N	Fund size (MM$)	Fund sequence number	Fund IRR (%)	Weighted fund IRR (%)	Excess IRR (%)
Public pension funds	589	332	5.7	26.3	17.0	9.9	723	1,368	3.8	6.7	4.8	1.5
Corporate pension funds	195	273	5.3	21.3	18.1	5.5	288	1,251	3.6	3.5	3.3	0.3
Endowments	335	310	5.5	35.9	30.3	22.1	294	978	3.9	2.1	2.7	1.5
Private endowments	*201*	*330*	*5.8*	*36.9*	*34.1*	*24.6*	*193*	*1,046*	*4.1*	*4.3*	*4.5*	*4.4*
Public endowments	*63*	*296*	*5.5*	*31.6*	*15.2*	*18.1*	*38*	*1,033*	*3.6*	*-2.5*	*-0.7*	*-3.0*
Foundations	*71*	*268*	*4.7*	*37.4*	*34.8*	*19.1*	*63*	*734*	*3.5*	*-0.9*	*0.0*	*-3.9*
Advisors	269	330	5.6	27.3	22.3	18.5	297	1,394	3.7	-2.6	-2.4	-3.0
Insurance companies	143	278	4.4	26.0	20.9	10.8	157	742	3.1	1.0	0.4	-3.7
Banks and finance companies	109	286	3.5	10.8	8.0	2.7	223	983	3.3	-0.2	-0.5	-1.9
Mainly retail banking	*70*	*299*	*3.8*	*12.4*	*9.7*	*6.9*	*121*	*998*	*3.4*	*1.2*	*0.2*	*-0.2*
Substantial corporate segment	*17*	*316*	*2.6*	*-6.0*	*-6.0*	*-8.3*	*69*	*1,224*	*3.5*	*-4.6*	*-4.6*	*-6.5*
Indeterminate bank type	*22*	*223*	*3.3*	*14.4*	*9.4*	*-8.1*	*33*	*427*	*2.7*	*5.4*	*7.2*	*2.2*
Other investors	64	158	5.5	29.3	32.7	15.3	48	772	2.5	-3.1	-3.1	-3.1
Overall	1,704	307	5.3	27.4	21.2	13.5	2,030	1,194	3.7	3.2	2.4	0.0

Table III
Fund Performance Regressions

This table reports the results of pooled regressions of fund IRR on dummy variables for LP classes and control variables.

The sample consists of 4,618 investments by 352 LPs in 838 funds closed between 1991 and 1998, as compiled by Asset Alternatives. Several versions of the following pooled regression are run and coefficient estimates and standard errors are reported by columns in the table:

$$FundIRR_{ij} = \beta_0 + \sum_k \beta_{0k} DummyLP_{jk} + \sum_k \beta_{1k} DummyLP_{jk} \times FundInflow_{ij} + \sum_k \beta_{2k} DummyLP_{jk} \times LPvintage_j + \beta_3 D\_sameregion_{ij} + controls\ .$$

$FundIRR_{ij}$ is the internal rate of return of fund i in %. Six dummy variables identify the class of LP for each LP-fund pair, with $DummyLP_{jk}$ taking a value of one for each observation consisting of an investment in fund i by LP j belonging to LP class k, and zero otherwise. "Public pension funds" is the base LP class, with zero values for all LP dummy variables. $FundInflow_{ij}$ is the year-over-year change in the amount of fund inflows into private equity in the country-year of the 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 that equals one if both LP j and the 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 zero 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.

For the Heckit regression in column (7), the first-stage probit regression is:

$$Prob\left(\begin{array}{c} Fund_{ij}\ has\ observable\ IRR\ data \\ \Big|\ independent\ variables \end{array}\right) = \Phi\left(\begin{array}{l} \gamma_0 + \sum_k \gamma_{1k} DummyLP_{jk} + \gamma_2 FundSize_i + \sum_m \gamma_{3m} GPRegion_{im} \\ + \sum_n \gamma_{4n} FundCategory_{in} + \sum_o \gamma_{5o} FundVintageYear_{io} \end{array}\right)$$

where $FundSize_{il}$ is the natural logarithm of the total closing amount of fund i in MM$, and $GPRegion_{im}$ is a dummy variable for the geographical location of the GP managing fund i.

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

Table III (continued)
Fund Performance Regressions

Dependent variable: Fund IRR							Heckit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dummy for LP class:							
(comparison category is public pension funds)							
Corporate pension funds	-6.26 **	-6.59 **	-7.80 **	-10.99 ***	-9.91 ***	-7.39	-6.76 **
	(2.78)	(2.83)	(3.70)	(4.16)	(3.75)	(6.01)	(3.25)
Endowments	11.92 **	11.58 ***	9.04 **	9.35 **	9.78 **	25.12 ***	13.58 ***
	(4.89)	(4.37)	(4.26)	(4.33)	(4.39)	(8.12)	(4.78)
Advisors	-1.96	2.92	2.95	3.64	1.86	26.51 **	5.24
	(3.29)	(2.85)	(5.12)	(5.72)	(5.41)	(10.64)	(3.21)
Insurance companies	-4.87	-5.65	-3.44	-3.96	-4.95	7.40	-3.81
	(3.95)	(3.89)	(4.33)	(4.64)	(4.59)	(8.60)	(4.58)
Banks	-11.23 ***	-9.05 ***	-4.91	-1.08	-5.80	-11.22	-7.49 **
	(2.85)	(2.96)	(4.50)	(6.20)	(4.49)	(9.29)	(3.66)
Other LPs	-7.82	-7.90	-31.29 ***	-28.04 ***	-27.59 **	-40.71 **	-4.63
	(5.12)	(5.03)	(9.98)	(7.00)	(10.97)	(15.62)	(4.86)
LP and GP in same region			-7.34 ***	-7.14 ***	-6.80 ***	-6.31 ***	
			(2.38)	(2.38)	(2.33)	(2.30)	
LP vintage			0.35	0.85 **	0.31	0.71	
			(0.22)	(0.43)	(0.23)	(0.43)	
LP size (log of total commitments to private equity)			-0.80	-0.42	-0.83	-0.38	
			(0.69)	(0.73)	(0.78)	(0.79)	
Total private equity fund inflow					-31.57 ***	-23.05 ***	
					(6.69)	(6.43)	
Interaction effects:							
Corporate pension funds * LP vintage				-1.60 **		-0.99	
				(0.72)		(0.65)	
Endowments * LP vintage				-0.69		-0.44	
				(0.61)		(0.61)	
Advisors * LP vintage				-0.24		-0.07	
				(0.83)		(0.83)	
Insurance companies * LP vintage				-0.68		-0.86	
				(0.81)		(0.86)	
Banks * LP vintage				0.85		-0.68	
				(1.55)		(1.29)	
Other LPs * LP vintage				-1.27		-2.27	
				(1.39)		(1.53)	
Corporate pension funds * inflow						-8.05	
						(10.60)	
Endowments * inflow						-30.71 **	
						(12.37)	
Advisors * inflow						-48.23 ***	
						(15.57)	
Insurance companies * inflow						-28.28 **	
						(13.93)	
Banks * inflow						9.62	
						(13.16)	
Other LPs * inflow						38.49	
						(24.64)	
Heckit Lambda							-7.82 *
							(4.22)
Fund category fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	Yes	Yes	Yes	No	No	Yes
LP region dummies	No	No	Yes	Yes	Yes	Yes	No
R-squared	19.8%	26.9%	23.5%	23.8%	20.9%	22.0%	n/a
Number of observations	2,755	2,755	1,582	1,582	1,531	1,531	4,402

Table IV
Reinvestment Decisions by LPs

This table summarizes reinvestment decisions faced by LPs when considering follow-on funds within same-family funds raised by a given GP. The sample consists of 2,716 reinvestment opportunities identified by reference to the sequence number of funds within the same fund family.

Panel A shows characteristics of 2,716 reinvestment opportunities faced by 300 LPs in 388 funds that had a follow-on fund within the same family. *Reinvested* is a dummy variable taking the value one if the LP reinvested and zero if investment in the follow-on fund was "discontinued" by the LP. *Current fund IRR* is the internal rate of return of the current fund (in which the LP has invested) that has a follow-on fund (in which the LP may or may not have invested), *next fund IRR* is the internal rate of return of the follow-on funds, *current fund size* represents the total dollar value raised from all investors in the current fund, and *change in fund size* is the percentage change in fund size from the current fund to the follow-on fund.

Panel B shows characteristics of the 2,716 reinvestment opportunities, split according to whether the LP decided to reinvest or not. Variable definitions are the same as in Panel A. *Excess IRR* is the internal rate of return minus the median IRR of the portfolio formed for each fund category every year. Also reported in Panel B are *p*-values from *t*-tests of differences in the means between reinvested and non-reinvested funds.

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

Table IV (continued)
Reinvestment Decisions by LPs

Panel A: Reinvestment Opportunities by Class of LP and by Fund Type

	Overall						Early-stage VC funds					
	N	Reinvested (Yes=1; No=0)	Current fund IRR (%)	Next fund IRR (%)	Current fund size (MM$)	Change in size, current to next fund (%)	N	Reinvested (Yes=1; No=0)	Current fund IRR (%)	Next fund IRR (%)	Current fund size (MM$)	Change in size, current to next fund (%)
Public pension funds	856	0.59	26.66	6.8	792	101	150	0.49	60.86	22.9	136	113
Corporate pension funds	317	0.38	16.74	3.5	760	95	72	0.38	38.72	22.7	123	98
Endowments	636	0.49	52.69	30.7	417	95	256	0.57	94.92	69.4	134	99
Advisors	463	0.50	33.40	1.5	691	106	137	0.58	72.10	16.1	139	137
Insurance companies	197	0.54	27.41	4.0	385	100	65	0.63	51.50	7.1	114	104
Banks and finance companies	175	0.40	6.34	-7.9	615	110	17	0.47	18.38	-14.2	139	137
Other investors	72	0.36	18.67	-0.7	369	158	26	0.42	25.22	-25.4	80	228
Overall	2,716	0.51	31.37	9.6	631	102	723	0.54	70.62	33.4	131	115

	Later-stage VC funds						Buyout funds					
	N	Reinvested (Yes=1; No=0)	Current fund IRR (%)	Next fund IRR (%)	Current fund size (MM$)	Change in size, current to next fund (%)	N	Reinvested (Yes=1; No=0)	Current fund IRR (%)	Next fund IRR (%)	Current fund size (MM$)	Change in size, current to next fund (%)
Public pension funds	263	0.63	33.50	10.0	309	93.6	443	0.60	9.89	-0.8	1,301	101.6
Corporate pension funds	81	0.38	28.38	5.0	227	113.7	164	0.39	3.78	-4.5	1,303	84.0
Endowments	219	0.49	39.82	18.6	297	85.6	161	0.36	3.91	-2.1	1,028	102.2
Advisors	167	0.59	35.64	-4.9	332	110.5	159	0.33	-3.06	-3.0	1,545	75.8
Insurance companies	67	0.58	32.95	5.9	270	89.1	65	0.42	3.19	0.0	774	106.4
Banks and finance companies	50	0.42	15.60	-14.4	235	94.1	108	0.38	0.82	-4.3	865	113.6
Other investors	27	0.48	32.10	15.4	197	133.2	19	0.11	-3.47	-3.5	1,008	97.0
Overall	874	0.55	34.46	7.7	292	97.6	1,119	0.46	5.16	-2.1	1,219	96.8

Table IV (continued)
Reinvestment Decisions by LPs

Panel B: Consequences of Reinvestment Decisions by Class of LP

		Mean current fund IRR (%)	Mean current excess IRR (%)	Mean next fund IRR (%)	Mean next fund excess IRR (%)	Mean current fund size (MM$)	Mean change in size, current to next fund (%)
Public pension funds	Reinvested	+31.1%	+15.9%	+11.0%	+12.9%	772.2	+115.3%
	Did not reinvest	+20.3%	+8.5%	0.4%	+6.4%	821.4	+80.6%
	t-test	0.014 **	0.069 **	0.006 ***	0.043 **	0.476	0.000 ***
Corporate pension funds	Reinvested	22.0	9.8	2.1	6.3	685.5	102.0
	Did not reinvest	13.5	1.5	4.5	7.8	806.7	90.2
	t-test	0.119	0.076 *	0.661	0.727	0.294	0.259
Endowments	Reinvested	50.5	30.9	43.7	38.9	310.1	92.7
	Did not reinvest	54.7	40.9	17.1	22.4	519.7	97.2
	t-test	0.601	0.179	0.002 ***	0.033 **	0.000 ***	0.527
Advisors	Reinvested	41.1	27.6	1.0	11.8	526.5	111.6
	Did not reinvest	24.7	17.7	2.0	11.3	855.4	101.1
	t-test	0.038 **	0.171	0.877	0.926	0.000 ***	0.462
Insurance companies	Reinvested	35.7	18.2	10.3	14.3	329.4	103.9
	Did not reinvest	16.8	6.7	-5.2	3.5	450.4	94.9
	t-test	0.078 *	0.237	0.093 *	0.140	0.135	0.424
Banks and finance companies	Reinvested	8.1	1.6	-4.3	0.6	555.8	113.9
	Did not reinvest	5.2	-1.0	-10.2	-1.4	654.1	108.0
	t-test	0.563	0.567	0.126	0.537	0.465	0.698
Other investors	Reinvested	39.3	24.7	14.0	20.5	195.3	96.8
	Did not reinvest	6.1	-3.9	-11.7	1.6	467.1	192.3
	t-test	0.005 ***	0.033 **	0.046 **	0.068 *	0.078 *	0.183
Overall	Reinvested	35.7	20.3	14.8	17.3	561.8	107.1
	Did not reinvest	26.8	15.9	3.7	10.2	702.2	96.5
	t-test	0.003 ***	0.104	0.000 ***	0.004 ***	0.000 ***	0.023 **

Table V
Value-at-Risk Analysis

This table reports the results of an analysis of value-at-risk by LP class. Each column heading shows the common cutoff point used across all LP classes. The estimated probabilities that funds in which LPs of each class invested fall below the given threshold are shown in the columns. The sample consists of 2,755 investments by 352 LPs in 341 funds that closed between 1991 and 1998 for which IRR data are available.

	Negative IRR	IRR<20%	IRR falls in lowest quartile	IRR falls in lowest half	IRR falls in bottom 3 quartiles
Public pension funds	28.5%	64.4%	21.3%	48.3%	77.2%
Corporate pension funds	36.3%	70.7%	30.2%	53.5%	79.5%
Endowments	22.5%	50.1%	17.3%	37.1%	61.4%
Advisors	38.4%	66.7%	32.6%	56.1%	73.1%
Insurance companies	32.7%	66.7%	28.7%	50.3%	76.6%
Banks and finance companies	47.6%	80.0%	38.2%	69.4%	88.2%
Other investors	32.2%	72.9%	25.4%	49.2%	81.4%
Overall	31.3%	63.9%	24.9%	49.3%	74.4%

Table VI
Recent Investments in Young Private Equity Groups

This table shows mean IRRs for funds managed by recently established GPs, grouped by LP class and fund type. The sample consists of 805 investments for which fund performance data are available, made by 226 LPs in 118 funds that closed between 1991 and 1998 and that were 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 the internal rate of return weighted by proportional commitment to the fund in each LP's private equity portfolio.

	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

Table VII
Investments in Over/Undersubscribed and Fast/Slow-to-Raise Funds

This table reports the results of analyses of investments in funds that were under- or oversubscribed, and in fast- and slow-to-raise funds.

Panel A shows the number of funds and LP-fund pairs in the sample for which over/undersubscription data are available from *The Private Equity Analyst*.

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

Panel C shows regression results following the specifications in Table III, for subsamples consisting of undersubscribed and just-subscribed funds, and for slow-to-raise funds.

For the Heckit regressions in columns (4) and (8) of Panel C, the first-stage probit regression is:

$$Prob\left(\begin{array}{c} Fund_{ij}\ has\ observable\ IRR\ data \\ \Big|\ independent\ variables \end{array}\right) = \Phi\left(\begin{array}{l} \gamma_0 + \sum_k \gamma_{1k} DummyLP_{jk} + \gamma_2 FundSize_i + \sum_m \gamma_{3m} GPRegion_{im} \\ + \sum_n \gamma_{4n} FundCategory_{in} + \sum_o \gamma_{5o} FundVintageYear_{io} \end{array}\right)$$

where $FundSize_{il}$ is the natural logarithm of the total closing amount of fund *i* in MM$, and $GPRegion_{im}$ is a dummy variable for the geographical location of the GP managing fund *i*.

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

Panel A: Over/Undersubscribed Funds

	Funds	LP-fund pairs
Undersubscribed (total closing < target close)	103	314
Just subscribed (totalclosing = target close)	48	254
Oversubscribed (total closing > target close)	356	2,867
Total observations with nonmissing data	507	3,435

Panel B: Fast/Slow-to-Raise Funds

	Funds	LP-fund pairs
Slow to raise (% raised in first year < 100%)	245	1,568
Fast to raise (fully raised within first year)	226	1,678
Total observations with nonmissing data	471	3,246
Total sample	838	4,618

Table VII (continued)
Investments in Over/Undersubscribed and Fast/Slow to Raise Funds

Panel C: Fund Performance Regressions for Subsamples Consisting of Undersubscribed and Just-Subscribed Funds, and Slow-to-Raise Funds

	Subsample Consisting of Undersubscribed and Just-Subscribed Funds				Subsample Consisting of Slow-to-Raise Funds			
Dependent variable: Fund IRR				Heckit				Heckit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dummy for LP class:								
(comparison category is insurance companies)								
Corporate pension funds	0.29	2.94	3.49	6.76	-4.21	-3.05	-2.27	-3.63
	(7.26)	(9.41)	(12.94)	(9.13)	(6.94)	(8.37)	(9.21)	(7.28)
Endowments	31.37 ***	26.17 *	25.42	35.44 ***	19.12 *	10.90	12.01 *	19.71 *
	(10.52)	(14.04)	(16.84)	(11.29)	(9.94)	(7.24)	(7.12)	(10.29)
Advisors	12.09	-7.96	-33.29	17.76	3.31	8.06	12.05	3.51
	(8.64)	(20.05)	(24.75)	(11.51)	(4.85)	(9.63)	(10.94)	(4.96)
Insurance companies	5.87	6.92	7.81	23.94	-15.36 *	-8.43	-10.67	-12.79
	(10.28)	(11.31)	(12.15)	(19.90)	(7.81)	(9.15)	(11.03)	(9.81)
Banks	-1.78	-8.14	-8.54	9.59	-10.74 *	-5.98	-5.71	-8.79
	(7.02)	(14.52)	(14.50)	(12.84)	(6.46)	(8.47)	(8.62)	(8.10)
Other LPs	-24.88	-47.07	-24.20	-6.17	0.11	-15.09	-13.79	2.38
	(20.44)	(34.54)	(20.46)	(20.86)	(6.18)	(11.35)	(10.60)	(8.17)
LP and GP in same region		2.77	3.68			-8.32 *	-7.90 *	
		(7.08)	(8.01)			(4.38)	(4.43)	
LP vintage		0.00	0.44			1.04 *	1.85	
		(0.51)	(0.68)			(0.62)	(1.18)	
LP size (log of total commitments to private equity)		-0.66	-0.88			1.26	2.11	
		(1.91)	(2.17)			(1.18)	(1.28)	
Interaction effects:								
Corporate pension funds * LP vintage			1.04				-0.91	
			(2.23)				(1.33)	
Endowments * LP vintage			-0.09				-1.57	
			(1.99)				(1.30)	
Advisors * LP vintage			-5.05 *				0.43	
			(2.79)				(1.58)	
Insurance companies * LP vintage			-1.61				-2.13	
			(2.17)				(2.02)	
Banks * LP vintage			0.90				-0.98	
			(1.93)				(1.77)	
Other LPs * LP vintage			-9.99 **				-2.51	
			(4.79)				(1.95)	
Heckit Lambda				-22.18				-6.03
				(19.40)				(8.75)
Fund category fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LP region dummies	No	Yes	Yes	No	No	Yes	Yes	No
R-squared	52.3%	50.9%	52.3%	n/a	28.9%	20.2%	20.6%	n/a
Number of observations	276	161	161	566	990	569	569	1,555

APPENDIX

Table A.1
Fund Performance Regressions Using Excess IRR as the Dependent Variable

This table reports the results of pooled regressions of fund excess IRR on dummy variables for LP classes and control variables.

The sample consists of 4,618 investments by 352 LPs in 838 funds closed between 1991 and 1998, as compiled by Asset Alternatives. Several versions of the following pooled regression are run and coefficient estimates and standard errors are reported by columns in the table:

$$ExcessIRR_{ij} = \beta_0 + \sum_k \beta_{0k} DummyLP_{jk} + \sum_k \beta_{1k} DummyLP_{jk} \times FundInflow_{ij} + \sum_k \beta_{2k} DummyLP_{jk} \times LPvintage_j + \beta_3 D\_sameregion_{ij} + controls\ .$$

$ExcessIRR_{ij}$ 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 $DummyLP_{jk}$ taking a value of one for each observation consisting of an investment in fund i by LP j belonging to LP class k, and zero otherwise. "Public pension funds" is the base LP class, with zero values for all LP dummy variables. $FundInflow_i$ is the year-over-year change in the amount of fund inflows into venture capital in the country-year of the 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 that equals one if both LP j and the 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 zero 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.

For the Heckit regression in column (6), the first-stage probit regression is:

$$Prob\left(\begin{array}{c} Fund_{ij}\ has\ observable\ excess\ IRR\ data \\ \Big|\ independent\ variables \end{array} \right) = \Phi\left(\begin{array}{l} \gamma_0 + \sum_k \gamma_{1k} DummyLP_{jk} + \gamma_2 FundSize_i \\ + \sum_m \gamma_{3m} GPRegion_{im} \end{array} \right)$$

where $FundSize_{il}$ is the natural logarithm of the total closing amount of fund i in MM$, and $GPRegion_{im}$ is a dummy variable for the geographical location of the GP managing fund i.

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

Table A.1 (continued)
Fund Performance Regressions Using Excess IRR as Dependent Variable

Dependent variable: Excess IRR						Heckit
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy for investor type:						
(comparison category is public pension funds)						
Corporate pension funds	-4.77 *	-8.61 **	-11.45 ***	-10.23 ***	-9.63	-5.11
	(2.61)	(3.66)	(4.22)	(3.71)	(6.24)	(3.49)
Endowments	21.70 ***	15.69 ***	15.49 ***	16.60 ***	26.79 ***	23.04 ***
	(6.83)	(4.57)	(4.51)	(4.72)	(8.32)	(7.66)
Advisors	7.63 **	11.36 **	11.14 **	11.52 **	27.90 ***	9.01 **
	(3.40)	(4.92)	(5.52)	(4.85)	(10.15)	(4.08)
Insurance companies	-0.57	2.08	1.10	0.84	12.68	-0.17
	(3.73)	(4.37)	(4.68)	(4.51)	(9.24)	(6.32)
Banks	-9.11 ***	-3.55	-2.09	-4.16	-10.18	-9.31 *
	(2.88)	(3.85)	(6.29)	(3.83)	(7.78)	(4.89)
Other LPs	-2.51	-39.34 ***	-39.26 ***	-36.98 ***	-53.85 ***	-2.91
	(5.20)	(8.92)	(8.21)	(9.76)	(9.31)	(6.30)
LP and GP in same region		-8.90 ***	-8.64 ***	-8.74 ***	-8.34 ***	
		(2.57)	(2.55)	(2.57)	(2.52)	
LP vintage		0.26	0.89 *	0.35	0.87 *	
		(0.23)	(0.45)	(0.23)	(0.46)	
LP size (log of total commitments to private equity)		-1.42 *	-1.10	-1.12	-0.86	
		(0.78)	(0.75)	(0.78)	(0.75)	
Total private equity fund inflow				-13.58 **	-7.28	
				(6.03)	(5.67)	
Interaction effects:						
Corporate pension funds * LP vintage			-1.55 **		-1.01	
			(0.72)		(0.68)	
Endowments * LP vintage			-0.97		-0.81	
			(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					-21.79 *	
					(12.44)	
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)	
Heckit Lambda						-1.21
						(10.09)
Fund category fixed effects	No	No	No	No	No	No
Year fixed effects	No	No	No	No	No	No
LP region dummies	No	Yes	Yes	Yes	Yes	No
R-squared	3.9%	5.2%	5.6%	5.9%	6.8%	n/a
Number of observations	2,684	1,541	1,541	1,491	1,491	4,096

Table A.2
Fund Performance Regressions Using Individual Funds as Observations

This table reports the results of regressions of fund IRR on numbers of LPs in each LP class that invested in the funds, and control variables.

The sample consists of 838 funds that were closed between 1991 and 1998 and for which data are available to run the following ordinary least squares regressions:

$$FundIRR_i = \beta_0 + \sum_k \beta_{1k} NumLP_{ik} + \beta_2 FundSize_i + controls\ .$$

$FundIRR_i$ is the internal rate of return of fund *i*, as reported by *Private Equity Performance Monitor*. $NumLP_{ik}$ is the number of LPs of class *k* that invested in fund *i*. $FundSize_i$ is the natural logarithm of the total closing amount of fund *i* in MM$.

For the Heckit regression in column (4), the first-stage probit regression is:

$$Prob\left(\begin{array}{c} Fund_{ij}\ has\ observable\ IRR\ data \\ \mid independent\ variables \end{array}\right) = \Phi\left(\begin{array}{l} \gamma_0 + \sum_k \gamma_{1k} NumLP_{ik} + \gamma_2 FundSize_{il} + \sum_m \gamma_{3m} GPRegion_{im} \\ + \sum_n \gamma_{4n} FundCategory_{in} + \sum_o \gamma_{5o} FundVintageYear_{io} \end{array}\right)$$

where $GPRegion_{im}$ is a dummy variable for the geographical location of the GP managing fund *i*.

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

Table II.A (continued)
Fund Performance Regressions Using Individual Funds as Observations

Dependent variable: Fund IRR				Heckit
	(1)	(2)	(3)	(4)
Number of public pension funds investing in fund	0.25	-0.17	-0.25	-0.17
	(1.28)	(1.26)	(1.26)	(1.50)
Number of corporate pension funds	-4.58 *	-4.92 *	-5.60 **	-6.10 **
	(2.75)	(2.68)	(2.82)	(2.99)
Number of endowments	4.10 ***	4.14 ***	4.14 ***	3.96 ***
	(1.25)	(1.22)	(1.26)	(1.32)
Number of advisors	1.23	2.47	0.99	1.90
	(2.09)	(2.08)	(1.98)	(2.24)
Number of insurance companies	-3.72	-2.13	-1.79	-3.61
	(3.65)	(3.57)	(3.63)	(3.93)
Number of banks	-6.37 *	-5.15	-6.89 *	-7.18 *
	(3.70)	(3.68)	(3.81)	(3.96)
Number of other classes of investors	-7.06	-9.38	-8.85	-6.80
	(7.17)	(7.09)	(7.36)	(7.61)
Log(size of fund)	3.34	6.20	8.18 *	6.16
	(3.94)	(4.12)	(4.29)	(4.53)
Average vintage of LPs that invest in fund		1.55 *	1.25	
		(0.88)	(0.90)	
Average total private equity commitments of LPs that invest in fund		-0.18 *	-0.19 *	
		(0.10)	(0.11)	
Total inflows into private equity			-32.78 ***	
			(10.73)	
Heckit Lambda				-1.64
				(10.70)
Fund category fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	No	Yes
Adjusted R-squared	19.1%	20.2%	18.5%	n/a
Number of observations	341	324	309	672

Endnotes

[1] Their calculation only examines institutions with greater than $100 million of securities under discretionary management, that is, those 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.

[2] Of 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 suggest 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)).

[3] For 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 intermediaries. (See Gromb and Vayanos (2002) for a similar argument.) Because the extent of agency problems may differ dramatically across institutions, considerable differences in the behavior of institutional investors could be expected.

[4] We thank the referee for suggesting this analysis.

[5] We thank Paul Gompers for pointing out this possibility.

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

[7] It 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 is not 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.

[8] Among the funds in our sample, the mean ratio of distributions to committed capital is 1.35. The ratio of total value to committed capital is 1.63, with the difference representing nonexited investments. These nonexited holdings represent the part of the IRR calculation that is more subjective.

[9] The 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 the 73 funds in those authors' sample, since the patterns that they report do not appear to conform to the more general trends identified by Venture Economics.

[10] This difference becomes particularly large when we form the weighted average IRRs discussed in footnote 12. Public endowments have a weighted average IRR of 20%, while private university endowments and foundations have weighted average IRRs of 43% and 41%, 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.

[11] We also estimate the investment performance of LPs by assigning weights to 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 is not known, we simply assume that the LP invests an equal amount in each fund. The results indicate that the pattern of performance differences across LP classes changes little.

[12] The 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.

[13] One 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 in new fund managers to secure the future choice of GPs. The need for this type of investment might further depress the performance of large

limited partners, since we know from Kaplan and Schoar (2005) that on average first-time funds underperform the industry.

[14] This 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.

[15] We also investigate whether there are significant differences across LPs within a class. While we find significant LP-specific fixed effects the distributions of fixed effects are relatively tight around the mean, in particular for the endowments. This implies that the performance differences across LP classes are not driven just by a few individual investors who happen to be lucky or unlucky.

[16] The independent variables used for the first-stage probit are: dummies for the different LP classes, fund size, GP region, fund category, and fund vintage year. All of the LP class dummies as well as fund size are significant, with coefficient estimates (standard errors in parentheses) as follows: corporate pension funds -0.21 (0.08), endowments -0.26 (0.09), advisors -0.19 (0.07), insurance companies -0.56 (0.10), banks -0.43 (0.10), other LPs -0.53 (0.13), and fund size 0.36 (0.08). These results suggest that IRR data are more likely to be available for funds in which public pension funds invest and for larger funds.

[17] Another concern might be that these results are 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 and the still relatively modest salaries. (If the performance differential across LPs were due to the differential skills of small teams, the patterns noted above would suggest that the labor market for limited partners is inefficient.)

[18] In 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.

[19] We also compare the standard deviations of returns across the different LP classes, and 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 in fact endowments have the lowest variation across all LP classes.

[20] Banks 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).

[21] While it is possible that the existing relationships and prestige of an established limited partner help in gaining access to the hottest new funds, typically new funds are not in the position of turning away new investors.

[22] We also repeat a regression approach along similar lines as in Table III. 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.

[23] Ideally, we would also have liked to conduct this exercise on the subsample consisting only of funds that were undersubscribed; however, the number of observations in those regressions would be very low, which would make interpretation of the results difficult.

[24] We 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.