Do Private Equity Fund Managers Earn their Fees? Compensation, Ownership, and Cash Flow Performance

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Abstract

We study the relations between management contract terms and performance in private equity using new data for 837 funds from 1984-2010. We find no evidence that higher fees or lower managerial ownership are associated with lower net-of-fee performance. Nevertheless, compensation rises and shifts to performance-insensitive components during fundraising booms. Further, the behavior of distributions around contractual fee triggers is consistent with an underlying agency conflict between investors and fund managers. Our evidence suggests that managers with higher fees deliver higher gross performance, and highlights that agency costs are an inevitable consequence of the information frictions endemic to agency relationships.

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I. Introduction

In private equity, the agency relationship between fund managers (the general partners, or GPs) and investors (the limited partners, or LPs) is governed by a management contract signed at the inception of the fund. The contract specifies the compensation of the GPs, the GPs' own investment in the fund, and a range of other investment parameters. These contracts are of critical importance to LPs: investing in private equity involves long-term financial commitments (funds typically last 10 to 13 years), and LPs have limited recourse to governance mechanisms outside the management contract. Thus, understanding how compensation and ownership terms are associated with fund performance and GP behavior is a critical question in private equity. It is also important for our understanding of delegated asset management more generally.

As private equity has grown in prominence, the industry has come under increasing scrutiny by observers and limited partners alike. Management contracts are at the core of the debate. Critics argue that the typical private equity contract allows GPs to earn excessive compensation and does too little to discipline GPs or to provide them with incentives to maximize LP returns. For example, Phalippou (2009) argues that the confusing nature of management contracts allows GPs to charge high fees for low average performance. Others have argued that excessive fees weaken managers' incentives to deliver good performance.[1] In the critical view, funds that charge higher fees should underperform in a net-of-fee sense relative to lower-fee funds. Concerns about excesses are particularly acute in boom fundraising periods and among large funds. The fact that private equity contractual arrangements and performance are typically shielded from public disclosures not only adds fuel to these claims, but also makes them inherently difficult to evaluate.

In this paper, we use a novel dataset, provided by a large institutional investor, of 837 buyout and venture capital (VC) private equity funds from 1984-2010 to study the relations between contracting terms and performance and cash flow behavior in private equity. The data include information on the fixed management fees and performance-based carried interest that the GP earns as compensation, as well as the GP's own investment in the fund,

[1] See, for example, "Private Equity Firms Reap Big Fees, Report Says", New York Times DealBook, November 1, 2010.

which determines their ownership stake. The data also contain the complete sequence of cash flows between LPs and GPs by fund, which we use to construct detailed relative performance measures and to examine cash flow behavior directly. The dataset is the first available in the literature to combine information on management contract terms with fund cash flows.

We begin by offering new descriptive evidence on GP compensation and ownership terms. This part of our analysis enhances the picture of private equity compensation previously painted in work by Metrick and Yasuda (2010a) and Gompers and Lerner (1999). The typical fund follows a "2/20/1" rule: a management fee of 2% per year, carried interest (carry) of 20%, and GP ownership of 1% of the total fund size.[2] At the same time, there is substantial variation in terms, both in the cross-section and over time. Our results indicate that during boom periods in private equity, when fund sizes grow, overall pay rises, even as a fraction of fund size. The overall rise is driven by increasing management fees, so in boom periods the composition of compensation shifts towards fixed compensation (fees) and away from variable compensation (carry).

By itself, this finding is consistent with the idea that compensation practices in boom periods undermine the incentives of GPs to deliver good performance. Yet, the real question is whether high-fee funds perform poorly. In contrast to this inefficiency view, we find no evidence that funds with higher fixed management fees underperform on a net-of-fee basis relative to lower-fee funds. Instead, management fees are essentially unrelated to net-of-fee performance. This basic result is robust to a variety of controls and performance measures and is unlikely to be driven by differences in systematic risk. This result also holds true among high-fee funds raised in boom fundraising periods, as well as funds that are both large in size and have high fees as a percentage of fund size.

This result implies that, relative to lower-fee funds, more expensive private equity funds typically earn sufficiently higher *gross* returns that they offset their higher fees. This pattern stands in striking contrast to the mutual fund literature, which generally finds a strong negative relation between mutual fund fees and net-of-fee performance (e.g. Carhart, 1997;

[2]For example, this would mean that a $100 million fund would generate $2 million in annual fees (depending on the basis for calculating fees, as we discuss at length below) plus 20% of overall profits from investments as revenue for the general partners. To obtain their 1% ownership stake, the general partners would make a $1 million investment in the fund.

Fama and French, 2010), consistent with the relative lack of sophistication of retail mutual fund investors (see Berk and van Binsbergen (2011) for an alternative perspective).

In addition, we find no evidence that funds with low GP ownership underperform, despite widespread concerns that managers of such funds are insufficiently bonded to the fund.[3] In fact, for buyout funds the opposite is true: performance is stronger among low-ownership buyout funds. This is consistent with the view that high-ability GPs prefer to diversify their personal portfolios.

Turning to carried interest, despite the limited variation in carried interest in the data, we find some evidence that buyout funds with high carried interest outperform, which although driven by a handful of funds, is contrary to the view that high carried interest is excessive. On the other hand, we find some evidence that high-carry venture capital funds underperform relative to the average VC fund. While this result is weak overall, it grows stronger in fundraising booms and among large VC funds.

Thus, the evidence offers little support for the inefficiency view. Private equity funds that are higher-cost in terms of fees and carry do not offer lower net-of-fee performance, nor do funds with lower GP ownership. We emphasize, however, three important caveats to this interpretation.

First, the fact that variation in fees is unrelated to variation in net-of-fee performance does not itself indicate whether, on average, private equity funds deliver positive *risk-adjusted* net-of-fee returns. While current evidence suggests that buyout funds have outperformed the S&P 500 by 3%-4% per annum net of fees (Robinson and Sensoy, 2011, Harris, Jenkinson, and Kaplan, 2012), no widely accepted method to risk-adjust fund-level private equity returns exists in the literature. Nevertheless, recent theoretical work in asset pricing by Sørensen and Jagannathan (2013) and Korteweg and Nagel (2013) suggests that the PME – our primary performance measure – embeds the necessary risk adjustments under appropriate assumptions about investor preferences.

A second caveat is the fact that we do not observe all potential fees that general partners charge. The concern here is that unobserved variation in fees might overturn the basic conclusion that high fee funds do not deliver lower net-of-fee performance. Indeed, Morris

[3]See, for example "Skin in the game is crucial, but how much?" Financial Times, November 18, 2012.

and Phalippou (2012) build on Gabaix and Laibson (2006) to argue that agency problems inside limited partner organizations create scope for private equity management contracts to shroud important and excessive fee structures such as transaction and monitoring fees (see also Carlin, 2009). Arguments along these lines must overcome the fact that our cash flow data is net of all fees paid—even the fees that we do not observe in the main terms of the contract. Thus, our empirical analysis relates observed fees to returns that are net of observed and *unobserved* fees. Although there is certainly unobserved variation in fees in our data, statistics from Metrick and Yasuda (2010a) and the annual reports of publicly-traded buyout organizations suggest that the fees we do observe are at least four to five times larger in magnitude than those we do not. Moreover, implausible correlations between observed and unobserved fees, and in turn performance, would be required in order for unobserved variation in hidden fees to overturn our findings. In particular, if as seems likely observed and unobserved fees are positively correlated, our conclusions would be strengthened. Also, the possibility of hidden fees applies mostly to buyout funds because venture capital funds do not typically charge monitoring and transaction fees, yet we find consistent results across both types of funds.

A final caveat concerns agency frictions. Our fee/performance findings by no means indicate that agency tensions between GPs and LPs are completely alleviated by the management contract. As Jensen and Meckling (1976) point out, the optimal solution to an agency problem balances the agency costs associated with the agent's preferred actions against the gains to the principal from having the agent behave differently. Indeed, the optimal solution to an agency problem almost never involves an agent doing exactly what the principal would like in the absence of information frictions, as doing so would be too costly for the principal. Jensen and Meckling (1976) emphasize that agency costs are an inevitable consequence of the frictions inherent in an agency relationship, and that the existence of such costs does not by itself imply that contractual arrangements are suboptimal.

Agency conflicts in private equity exist largely because GPs must exert costly effort to select, monitor and exit investments, and they possess private information about both their underlying quality and their suitability for exit at a particular point in time. This information asymmetry allows GPs to potentially game the timing of exit decisions to exploit contractual

provisions that are designed to protect the LP's return. We find evidence of agency costs by exploring agency frictions suggested by two contractual provisions common in our data.

First, Choi, Metrick, and Yasuda (2011) report that the typical management contract calls for GPs to first return to LPs all contributed capital (including that for management fees), plus in the case of buyout funds an 8% preferred return, before carried interest is earned. After the preferred return has been cleared, the GP typically enters a "catch-up" period, during which they earn 100% of the net return on exits until it is as if they earned 20% on all previous investments.[4]

This "waterfall" has the clearly desirable effect, from LPs' perspective, of allowing them to receive a return on invested capital before GPs earn any profit-sharing. Yet the catchup provisions create an incentive for the GP to accelerate distributions immediately after the waterfall date. By doing so, the GP earns immediate carried interest on those distributions, and avoids the risk that the investments might later decline in value. The problem is that this behavior will lead some investments to be harvested too early, when delaying would have generated more value for LPs. Consistent with these concerns, we find that distributions cluster around the waterfall date. Such clustering is difficult to rationalize as an innocuous response to changes in exit opportunities, because there is no reason – other than the GP's particular incentives – why the attractiveness of an exit would spike around waterfall dates.

The second agency-related contractual provision that we observe concerns the basis upon which management fees are calculated and how this affects distribution behavior. In about a third of funds, the basis of the management fee shifts to net invested capital (cost basis of all investments less cost basis of realized investments) during the funds life (usually after 4-5 years). While the goal of such a contractual provision is to lower the expenses that LPs pay, it also creates the incentive for GPs to hold on to "living dead" or "zombie" investments rather than liquidate them and distribute the (modest) proceeds in order to continue earning management fees on the capital invested.[5] We find evidence consistent with this concern. Funds whose fee basis changes from committed capital to net invested capital are indeed

[4]For example, if $100 million had been returned to limited partners to clear the 8% preferred return, the GP would earn 100% of the next $20 million in exits, and then they would share on an 80/20 basis any returns in excess of the hurdle rate thereafter.

[5]See for example "Private Equity Trapped in 'Zombie Funds'", The Financial Times, December 11, 2011.

more likely to exit investments later in the fund's life.

Overall, the evidence is most consistent with the view that private equity management contracts reflect efficient bargaining by sophisticated parties. In such an equilibrium, fees reflect agency concerns and the productivity of manager skills, yet agency costs remain nonzero as an unavoidable consequence of the information frictions inherent in any agency relationship.

The findings in this paper contribute to several branches of the literature on private equity and delegated asset management. Our work links the branch of the private equity literature that studies aspects of management contracts with that studying cash flow performance. The former literature includes Metrick and Yasuda (2010a), Gompers and Lerner (1999), and Litvak (2009). The latter literature includes Kaplan and Schoar (2005), Phalippou and Gottschalg (2009), Ljungqvist, Richardson, and Wolfenzon (2007), Jones and Rhodes-Kropf (2003), and more recently Robinson and Sensoy (2011) and Harris, Jenkinson, and Kaplan (2012). DaRin, Hellmann, and Puri (2011) and Metrick and Yasuda (2011) survey the private equity literature.

Our work also adds to the literature studying compensation, ownership, and their link to performance in other delegated asset management settings, notably mutual funds and hedge funds. As noted above, several studies find a negative relation between mutual fund fees and net-of-fee returns. Busse, Goyal, and Wahal (2010) find that institutional investment portfolios come much closer to earning back their fees on average than do mutual funds. Khorana, Servaes, and Wedge (2007) find that mutual fund manager ownership is positively associated with performance. Agrawal, Daniel, and Naik (2009) find that hedge fund managers with stronger incentive compensation and higher ownership earn higher net returns, suggesting that hedge fund managers do not capture excess returns in the form of higher compensation to the same extent that is true in private equity.

II. Data and Sample Construction

A. Coverage, Variables, and Sample Selection

Our analysis uses a confidential, proprietary dataset obtained from a large, institutional limited partner with extensive investments in private equity. The data provider's overall private equity portfolio was assembled over time through a series of mergers that occurred for reasons unrelated to each company's private equity portfolio, and so can be thought of as being obtained from a set of LPs that later merged. The sample consists of all the deals that this collection of formerly independent LPs invested, but no deals in which they did not invest. Table 1 reports that there are 837 buyout and venture capital funds in our sample, representing almost $600 billion in committed capital spanning vintage years 1984-2009. The sample comprises a significant fraction of the documented universe of private equity. We have 34.4% of the Venture Economics (VE) universe of total capital committed to U.S. venture capital and buyout funds, and 55.7% of that committed to U.S. buyout funds, over the same time period.

For each fund, the data contain fund-level information on the management fees and carried interest that the GPs earn as compensation. The data also contain the GPs' own investment (capital commitment) in the fund, which determines their ownership stake. The dataset reports the complete quarterly cash flows (capital calls and distributions) between the funds and their limited partners, as well as quarterly estimated (by the GP) market values of unrealized investments. The cash flows extend to the second quarter of 2010, and are net of any and all fees and carried interest We also have data on fund size and on each fund's sequence number (whether it is the first, second, third, etc., fund to be offered by that PE firm), and we know whether any two funds belong to the same partnership.[6] The data were anonymized before they were provided to us so we do not know the identity of the GPs or the names of the funds.

The dataset comprises the largest and most recent sample of private equity compensation terms in the literature, and is the first available for academic research to include information on GP ownership. Critically for our purpose, the dataset is also the first to combine cash

[6] All 837 funds are bona fide funds. There are no side-car or co-investment vehicles in our data.

flow information with compensation and ownership data. Another important advantage of the data is that they come directly from the LP's internal accounting system, and so are free from the reporting and survivorship biases that plague commercially available private equity databases (Harris, Jenkinson, and Stucke, 2010).

While our data have many advantages, no data set is perfect and ours is no exception. The data do not cover all aspects of the management contracts. In particular, we lack information on the specific carry timing rules for a given fund, on the split of portfolio company transaction and monitoring fees between GPs and LPs (relevant only for buyout funds), or side agreements between different investors and fund GPs. In principle, this has the potential to create measurement error problems for our analysis. However, as we discuss in detail in Section IV.C, to bias our conclusions these provisions would have to be correlated in specific and implausible ways with the variables we include in our analysis.

Because our data come from a single (albeit large) limited partner, the representativeness of the sample is a natural concern. Assessing representativeness is difficult because the universe of private equity funds is not available. Commercially available databases are themselves incomplete and unsuitable for our purpose because they include neither compensation/ownership data nor cash flow data. Nonetheless, Robinson and Sensoy (2011) compare our IRR statistics to commercially available databases (VE, Preqin, and Cambridge Associates) as one way to gauge representativeness, and find no significant differences between our sample buyout fund IRRs and these sources. Venture capital IRRs in our data are somewhat below what is reported in commercial databases. However, Lerner, Schoar, and Wongsunwai (2007) and Sensoy, Wang, and Weisbach (2013) show that the best-performing VC funds raised in the 1990s are concentrated among one particular class of LP (endowments), who seem to have superior access to funds. Thus the differences for venture capital likely mean that our sample is representative of funds to which the typical VC investor has access. Moreover, our cross-sectional analyses are only sensitive to selection issues insofar as any potential bias in the data is correlated in specific ways with the explanatory variables.

B. Summary Statistics on Fund Characteristics

The characteristics of our sample funds are presented in Table 1. As noted above, the 837 funds in our sample represent almost $600 billion in committed capital. This figure is 26.5% of the total capitalization of the VE universe of the same fund types over the 1984-2009 vintage year time frame. The US portion of our sample is 34.4% of the total capitalization of the U.S. private equity universe covered by VE. Coverage varies significantly by fund type. Our data include 295 venture capital funds representing $61.4 billion in committed venture capital, or around 16% of the VE universe of U.S. venture funds. We have 542 buyout funds, for a total committed capital of $535.5 billion, representing 55.7% of the total capitalization of the VE U.S. buyout universe. The proportions of first, second, and third-sequence funds in our data are 35%, 23%, and 15% respectively. The average fund size is $208 million for venture capital funds and $988 million for buyout funds.

C. Summary Statistics on General Partner Compensation and Ownership

Table 2 provides summary statistics on GP compensation terms (fixed management fees and performance-sensitive carried interest) and on their own capital commitments to the funds they manage, which in turn determine their ownership stakes in the funds. These terms are all contracted at the beginning of a fund's life, and are not renegotiated during the life of the fund. Summary statistics on these terms are useful in their own right because no prior work has had access to data on GP ownership, and because our sample of compensation terms is both larger and more recent than Gompers and Lerner (1999) and Metrick and Yasuda (2010a).

C.1. Management fees

We begin with management fees. For 82 of our 837 funds, management fees are either unknown to us or are not specified in advance. We exclude these funds from the fee statistics and analyses, as do Gompers and Lerner (1999).

In the management contract, management fees are expressed as a fee percentage and a basis to which the percentage applies. As Table 2 shows, 92% of all funds have an initial fee

basis of committed capital (i.e., fund size, which is fixed for the life of the fund). The initial percentage fee (the percentage in effect for the first year of the fund's life) is usually in the range of 1.5% to 2.5%. The average (median) initial fee for VC funds is 2.24% (2.50%), while the figures for buyout funds are lower, at 1.78% for the mean and 2.00% for the median.

The contract frequently stipulates that the fee percentage and/or basis changes at some point during the life of the fund. These changes almost uniformly result in lower management fees later in the fund's life. Table 2 shows that 45% of funds see their fee percentage change at least once, while 33% have a change in basis.[7] 59% of funds have one type of change or the other (or both), while 18% have both. Venture capital funds are more likely to have the fee percentage change compared to buyout (55% compared to 38% of funds), while the opposite is true for fee basis changes (12% of VC funds have their fee basis change, compared to 41% of buyout funds).

Changing fee percentages and bases imply that we cannot simply compare management fees across funds solely on the basis of their initial fee percentages and bases. Instead, we use the fee basis and percentage information to forecast the expected (at fund inception) dollar management fee for each year of the fund's expected life (assumed to be 10 years for all funds). We then calculate each fund's "lifetime fees", defined as the undiscounted sum of the expected annual fees. We also calculate the present value (at fund inception) of these lifetime fees by discounting each expected annual fee using the 10-year Treasury bond rate in effect at the fund's inception ("PV lifetime fees").[8] These calculations follow Metrick and Yasuda (2010a), and details are provided in the Appendix.

Table 2 displays summary statistics for lifetime fees and their present value, expressed as a percentage of committed capital. The average (median) lifetime fee is 20.37% (21.38%) of committed capital for VC funds, and 14.49% (14.23%) for buyout funds. The present value of the lifetime fee is on average (median) 16.01% (16.69%) of committed capital for VC funds, and 11.65% (11.52%) for buyout funds. For both types of funds, fixed management fees are a substantial fraction of the total capital committed by LPs. Buyout fund fees are a

[7]The most common basis change is to "net invested capital", defined as the total (equity) capital invested in portfolio companies to date minus the (equity) cost basis of all realized investments. The change to net invested capital has the effect that fees are earned only on active, and not on already harvested investments.

[8]We choose the risk-free rate over the contracted life of the fund as the discount rate because management fees are a contractual obligation over this horizon.

significantly smaller percentage of fund size than venture capital fund fees. However, dollar fees are on average higher in buyout funds because of their greater size.

Overall, while the median initial fee percentage is indeed 2%, consistent with the "2 and 20" conventional wisdom, there is a substantial amount of variation in management fee terms and expected values, both across and within fund classes.

C.2. Carried Interest

Table 2 also shows summary statistics for the carried interest (or carry) of the full sample of funds. The carry specifies the GP's share of the profits earned by the fund. Consistent with prior work, a carried interest of 20% is the norm, obtained by 89% of VC funds and 97% of buyout funds. 1% of VC funds and 2% of buyout funds have carry below 20%. 10% of VC funds and 1% of buyout funds have carry above 20%. The average carried interest is 20.44% for VC funds and 19.96% for buyout funds.

C.3. General Partner Ownership

Finally, Table 2 shows summary statistics for the capital commitments of the general partners to their funds. The GP's capital commitment determines its ownership stake in the fund, and our data are based on the actual GP commitment.

The median GP capital commitment is 1% of fund size, resulting in a 1% ownership stake. 56% of VC funds and 35% of buyout funds have a GP ownership between 0.99% and 1.01%. The average GP ownership is 1.78% for VC funds and a significantly higher 2.38% for buyout funds. For VC funds, 26% have ownership stakes above 1.01% and 18% have ownership below 0.99%; for buyout the proportions are 43% and 23%, respectively.

Thus, while it is in some sense standard for general partners to post 1% of total committed capital, one-half to two-thirds of GPs invest smaller or larger stakes in their funds, particularly in buyout funds. Moreover, buyout GPs have higher ownership, in both percentage and dollar terms, than VC GPs.

III. The Determinants of General Partner Compensation and Ownership

In this section, we analyze the determinants of general partner management fees, carried interest, and ownership terms. We relate these contractual terms to market conditions and other observable fund characteristics at the time a fund is raised.

Despite the oft-stated concerns about excessive fees in boom periods, no prior work analyzes how compensation terms vary over fundraising cycles. To this end, a key explanatory variable in our analysis is "ln (Industry Flows)", which measures the natural logarithm of the total market-wide committed capital to the fund's asset class (buyout or VC) in the fund's vintage year. "Industry Flows" is thus the total fundraising by all funds of the same type and same vintage year as the focal fund. We construct this measure using data from Venture Economics, and not our own sample funds, to capture market-wide fundraising activity.

We employ fund size and sequence number as additional explanatory variables. Gompers and Lerner (1999), analyzing a sample of venture capital funds raised before 1992, find that larger and older funds have higher carried interest and lower management fees, favoring a learning model of GP compensation rather than a signaling one. Our contribution in this regard is to consider whether these basic patterns continue to hold in more recent times, which is important in view of the huge influx of capital in the industry since 1992, and whether the patterns extend to buyout funds as well as venture funds.

These analyses are reported in Table 3. In each panel within the table, Columns (1)-(3) consider buyout funds only, and Columns (4)-(6). Columns (3) and (6) include vintage year fixed effects to emphasize cross-sectional variation holding market conditions fixed.

A. Management Fees

We begin with an analysis of management fees, reported in Panel A of Table 3. The dependent variable is the present value of lifetime fees as a percentage of fund size. Several patterns emerge.

"PV Lifetime Fees" is strongly increasing in fundraising activity for both VC and buyout funds, consistent with greater GP bargaining power in booms. The coefficients on 'ln

(Industry Flows)" imply that a doubling in industry-wide committed capital is associated with a 41%-71% increase in the present value of lifetime fees. Moreover, we know that in boom times fund sizes also increase.[9] Thus, in boom times both fund size and fractional fees increase, so there is a multiplicative, large positive effect on dollar fees.[10]

Larger funds, both buyout and venture, have significantly lower fractional fees in present value terms. These results suggest that high-ability GPs face a fundamental tradeoff between larger fund size and higher fractional fees.[11] Gompers and Lerner (1999) find the same pattern in their sample of VC funds. Not only do their findings hold in the more recent data and extend to buyout funds, but the tradeoff is more pronounced for buyout funds, consistent with scalability arguments advanced by Metrick and Yasuda (2010a). If the size of venture funds is inherently more limited by the constraints of the investment technology, then venture GPs have less scope to trade off fractional fees in exchange for larger funds.

We also examine variation in the initial management fee percentage and whether the fee basis or percentage changes at some point in the fund's life. These analyses reveal that during fundraising booms, fees become front-loaded early in a fund's life. (For brevity, we do not tabulate these analyses.) Thus, during fundraising booms, fees become front-loaded and increase, even as a percentage of fund size.

Our findings on management fees raise the question of the relative magnitude of the variation in fees across GPs compared to within GPs. The cross-sectional standard deviation of within-GP average "PV Lifetime Fees" is 3.5% of fund size for buyout GPs and 2.9% of fund size for VC GPs. The cross-sectional average within-GP standard deviation of "PV Lifetime Fees" is 2.2% of fund size for buyout GPs and 2.0% of fund size for VC GPs. Thus, the within-GP variation in fees is about two-thirds of the across-GP variation. These results suggest that the market's assessment of a given GP's talent changes over time, but that

[9]See for example Kaplan and Strömberg's (2009) analysis of buyout funds. In untabulated results we confirm this finding for both buyout and venture funds in our sample.

[10]In untabulated robustness tests we confirm that the initial management fee and the undiscounted lifetime fees also respond positively to industry fundraising flows. We also confirm that fees are not more responsive to flows when flows are high compared to when they are low.

[11]The fact that fund size and fees are jointly determined as a function of the GP's ability does not confound this interpretation. In the absence of any tradeoff, the direct effect of ability on both size and fees should be positive, which by itself would induce a positive correlation between size and fees in the data. Thus, the fact that we cannot observe and control for ability biases us away from finding the negative correlation (tradeoff) that we do.

there is more variation in talent across GPs than within a GP.

B. Carried Interest

Panel B of Table 3 analyzes carried interest. The panel shows that carried interest is positively related to fund size (and, for VC funds, fund sequence), for both buyout and venture funds. This finding is consistent with Gompers and Lerner's (1999) and Hochberg et al.'s (2010) findings for VC funds, who show, respectively, that larger venture groups and those with good past performance have higher carry.

Controlling for fund size, carried interest does not move cyclically. Combined with the evidence in Panel A, these results imply that GP compensation rises and shifts to fixed components during fundraising booms, consistent with greater GP bargaining power during booms and a preference for fixed compensation. Thus, the results suggest that because talented GPs are in scarce supply, capital inflows to private equity result in more favorable GP compensation, even as a fraction of fund size.

The results in Panels A and B of Table 3 also suggest that compensation terms in VC vary with other fund characteristics to a greater extent than is true in buyout funds. This is consistent with scalability arguments whereby size alone can absorb differences in demand for GP services to a greater extent in buyout than is possible in venture capital.

C. General Partner Ownership

Panel C of Table 3 analyzes GP ownership. Like carried interest, fundraising conditions do not affect GP ownership stakes. There is some evidence that first-time buyout funds (but not VC funds) signal their effort/ability with higher ownership, but the result becomes just short of statistical significance when vintage year fixed effects are included. Thus, the opposing forces that GP bargaining power increases in booms and as they gain experience (which would allow them to negotiate lower ownership), and on the other hand agency concerns grow at the same time (suggesting LPs will prefer higher GP ownership), appear to cancel out in the data.

The relation between GP ownership and size is positive and concave for buyout funds, but negative and convex for VC funds. That is, larger buyout funds are associated with

higher GP ownership stakes, but for larger VC funds the relation is the opposite. This is consistent with an agency explanation, in which agency considerations are greater in buyout, requiring buyout general partners to hold larger stakes in equilibrium as fund size increases.

D. Summary and Discussion

Overall, the results in Table 3 provide novel evidence on the determinants of managerial compensation and ownership in the private equity industry. Times of high fundraising activity are associated with higher fixed management fees but are unrelated to carried interest or GP ownership terms. Thus, during fundraising booms, GP compensation rises and shifts to fixed components, a conclusion that is reinforced by the fact that absolute performance tends to be lower following fundraising booms, leading to lower carry dollars even for a fixed carry percentage.[12] This, in turn, implies that the elasticities of GP compensation and wealth to fund performance decline during boom times.

The analysis also draws a clear picture of how direct, contractual compensation and incentives vary in the cross-section of funds (see Chung et al. (2012) for an analysis of indirect incentives). Carried interest is higher in larger funds, while management fees are lower. These findings imply that the elasticity of GP compensation to performance is higher in larger funds. The results are consistent with the idea that higher-ability GPs raise larger funds and require stronger incentives, and with a trade-off between size and management fees. They are also consistent with the idea that higher-ability GPs are more willing to link compensation to performance. In buyout funds, ownership patterns reinforce this conclusion. In VC, lower ownership among larger funds dampens the incentive effects of the higher carried interest.

As discussed in the subsections above, all of these results are potentially consistent with optimal contracting explanations. However, they are potentially consistent with criticisms of private equity compensation and incentives as well. For instance, higher fixed compensation in boom times may result in lower net performance to LPs if contracts are inefficient and GPs are extracting too much. Or, if contracts are efficient, such compensation may simply

[12]See Robinson and Sensoy (2011) or Kaplan and Stromberg (2009) for evidence on the relation between absolute performance and fundraising cycles.

reflect a higher productivity of GP skills in those times, and the (at least partial) ability of GPs to capture the associated returns, so net performance to LPs need not suffer.

The "acid test", therefore, is how compensation and ownership terms relate to the cash flow performance of the funds. We take up this issue in the next section.

IV. Compensation, Ownership, and Cash Flow Performance

A. Cash Flow Performance Measures

To relate compensation and ownership terms to performance, we would ideally like to form relative performance measures that account for fund-specific loadings on systematic risk factors in returns. Unfortunately, even with cash flow data, obtaining reliable fund-level estimates is extremely difficult in the private equity setting, due to the illiquidity of the funds and the fact that purely objective measures of interim performance are not available (see Korteweg and Sorensen, 2010, and Driessen, Lin, and Phalippou, 2012, for discussions of the issues involved). Given these constraints, we construct three measures of performance, and further explore the sensitivity of our conclusions to differences in systematic risk in section IV. D. below.

Our first performance measure is the public market equivalent (PME) pioneered by Kaplan and Schoar (2005). The PME is calculated by first discounting all cash distributions and capital calls using a discount rate formed by computing the total return of the S&P 500 earned between the fund's inception and the date of each cash flow. The PME is equal to the ratio of the sum of discounted distributions to discounted calls, and measures the lifetime return (net of all fees and carried interest) of the fund relative to that of the S&P 500. By benchmarking returns to public markets, the PME is a major improvement over the IRR, a purely absolute performance measure.

Our second measure of performance is a "tailored PME" that is computed in the same way as the regular PME, but using different benchmark indexes depending on the type of fund. For venture funds, we use the Nasdaq composite total return index. For buyout funds, we group funds according to size terciles, where size is measured by a fund's total committed

capital, and use the corresponding Fama-French size tercile portfolios as the benchmark.[13] In this way, the tailored PMEs help get a closer match compared to the regular PME on variation in systematic risk that is related to the size of private equity portfolio companies, as well as variation that is due to the technology focus of much venture investing.

Our third measure is a "levered PME", that uses a hypothetical levered S&P 500 index as the discount rate in the PME calculation, with the levered index return equal to an assumed β times the actual index return. The levered PMEs thus measure relative performance under the assumption that the fund β is that which is assumed in the levered index calculation. While, as noted above, fund-level estimates of β are difficult, the literature has produced industry-level estimates. We use a β of 1.3 for buyout funds and 2.5 for venture capital funds, matching the estimates in Driessen, Lin and Phalippou (2012) for buyout and Korteweg and Sorensen (2010) for VC.[14] Robinson and Sensoy (2011) provide details on the levered PME calculations and descriptive information on the distribution of PME, tailored PME, and levered PME in the sample.

All three of these measures of fund returns to LPs are net of any and all fees and carried interest, including any unobserved fees as discussed in section IV.C. below.

B. The Cross-Section of Contract Terms and Cash Flow Performance

Table 4 investigates the relations between these measures of net-of-fee performance and compensation and ownership terms. If GPs with higher compensation are extracting too much, then compensation should be negatively related to net-of-fee performance. Similarly, if low GP ownership means that GPs are insufficiently invested in their performance, funds with low GP ownership should perform poorly.

On the other hand, if compensation is efficient, then there are two possibilities. If GPs with higher compensation generate higher gross returns and capture them through that higher compensation, we would expect no relation between compensation terms and net performance. If instead some excess returns are shared with LPs, perhaps because competition

[13]These portfolios are constructed using NYSE size breakpoints at the 30^{th} and 70^{th} percentiles, and are available on Ken French's website. Our results are similar using instead the categorization in our data of whether the fund is focused on small, middle, or large buyouts.

[14]Our results are robust to using a VC β of 2.7 as estimated by Driessen, Lin and Phalippou (2012).

among LPs is imperfect, then we would expect compensation to be positively related to net performance. Also, if ownership terms are set efficiently, then low GP ownership funds should not underperform. They may even outperform if high-ability managers prefer low ownership stakes (for instance, for diversification of their personal portfolios) and are willing to allow LPs to capture some excess returns in exchange for lower required stakes.

Table 4 uses the full sample of funds. For unliquidated funds, the final market value of unrealized investments at the end of the sample period is treated as if it were a cash flow distribution. This has the advantage of allowing us to include funds raised relatively recently, in particular in the end of the buyout boom. The disadvantage is that stated market values are potentially subjective.[15]

The first two specifications use the PME as the performance measure, the next two the tailored PME, and the final two the levered PME. Odd-numbered columns focus on buyout funds, even-numbered on venture funds. All specifications include vintage year fixed effects to focus on cross-sectional variation at a point in time, and standard errors are clustered by vintage year. (We take up the issue of time-series variation in Section IV. E below.)

There is no evidence that funds with higher management fees have worse net of fee performance, contrary to the inefficiency view. This finding holds across all specifications and in both panels. These results are unlikely due to a lack of power, given the wide variation in performance and lifetime fees, the large sample size, and the fact that significant results do obtain for other variables.

Turning to carried interest, buyout fund performance is significantly positively related to carried interest, the exact opposite of the inefficiency view. This result holds for all three performance measures, and obtains despite the fact that buyout funds display only modest variation in carried interest. Nevertheless, since almost all buyout funds have carried interest of exactly 20%, the result is necessarily driven by the few outliers that do not have 20% carry, and should be interpreted accordingly.

There is no significant relation between carry and any performance measure among ven-

[15]In unreported analysis, we have repeated Table 4 for two subsamples: liquidated funds, defined analogously to Kaplan and Schoar (2005) as funds with vintage years prior to 2005 and with no cash flow activity for the last six quarters of our sample period, and funds with vintage years prior to 2001. In both cases performance evaluations are based primarily on actual cash flows. These results are qualitatively identical to those reported in Table 4.

ture capital funds, contrary to the inefficiency view, despite the fact that venture funds display more variation in carry than do buyout funds.[16]

Finally, turning to GP ownership, there is no evidence that buyout or venture funds with GP ownership below the modal 1% underperform, contrary to concerns that low GP ownership translates into inadequate incentives to care about performance. Just the opposite is true for buyout funds. The 23% of buyout funds with GP ownership less than 1% outperform by all performance measures, with PMEs about 0.20-0.30 higher than their higher-ownership counterparts.[17] This magnitude is large relative to the sample average PME of 1.18 (Robinson and Sensoy, 2011). A PME difference of 0.20 means an extra 20% outperformance relative to the S&P 500 over the life of the fund, or about 4% per year given an investment holding period averaging five years.[18]

Our conclusions from Table 4 are robust to a number of alternate specifications (unreported for brevity), including omitting controls for fund size and sequence, entering each contract term individually, and pooling buyout and venture capital funds.[19]

Overall, the evidence in Table 4 offers little support for the view that variation in GP compensation and ownership is inefficient. Instead, the evidence is most consistent with a Berk and Green (2004) type of equilibrium in which compensation and ownership terms reflect agency concerns and the productivity of manager skills. In this view, GPs with higher fees earn their pay by generating higher gross performance, leading to either no relation or even a positive relation between compensation and net performance. Similarly, GPs with lower ownership do not underperform, and in the case of buyout funds generate excess returns that are shared with LPs. These observations are consistent with the view that GP services are the primary scarce resource in private equity (Kaplan and Schoar, 2005), while at the

[16]However, in the liquidated sample, VC carried interest is negatively associated with tailored PME and levered PME.

[17]These analyses focus on indicator variables for whether GP ownership is above or below the modal 1% because the ownership distribution is bounded below at 0%, and the resulting compressed distribution below 1% obscures these findings in linear specifications.

[18]Of course, our results do not imply that performance of low-GP ownership funds would not improve further if ownership were exogenously forced to be higher holding all else equal.

[19]We have explored alternative specifications, including splitting the sample into performance terciles, to try to identify settings in which there is a negative relation between net-of-fee performance and fees. We find no such evidence. If anything, there is some evidence of a positive fee/performance relation among high performing funds, but this evidence is weak.

same time some excess returns are shared with LPs.

C. Omitted Aspects of Management Contracts

As noted in Section II, our data do not cover two aspects of GP compensation structures. The first, applicable to buyout funds, is that funds sometimes charge transaction and monitoring fees directly to the portfolio companies they own. This concern does not apply to venture capital funds because they do not typically charge such fees. The second is that while we have information on the carried interest percentage (whether it is, say, 20% or 25%), we do not know the specific rules governing the timing of the payment of carried interest to general partners, which can make a given percentage more or less valuable to the GP in present value terms (Metrick and Yasuda, 2010a).

It is therefore important to consider whether these omissions are likely to bias the fee/performance and carry/performance results in Table 4. We emphasize that neither issue results in our performance variables being measured with error. The capital calls we observe include all fee payments, and the distributions we observe are the actual net distributions that the LP receives. All of our performance measures are net of both fees for which we have contractual information and any and all unobserved fees.

Moreover, the best available current statistics on the magnitudes of unobserved fees and carry timing rules suggests that the terms we do observe are much larger, by a factor of about four or five, than the potential terms we do not observe.

Metrick and Yasuda (2010a) calibrate the present value of transaction and monitoring fees for buyout funds. They estimate that the typical scheme among funds that charge such fees results in revenue of 2.55% of committed capital in present value terms to the GPs over the life of the fund. Under the most extreme scheme, in which GPs keep all such fees (instead of the more typical practice of using such fees to rebate a portion of the base management fee), the present value rises to 4.24%. These figures are overstated for the average fund because Metrick and Yasuda (2010a) report that one-third of buyout funds do not charge transaction fees. Adjusting for this drops the estimates to 2.0% and 3.1%, respectively. (In addition, there are surely funds that do not charge monitoring fees). Nevertheless, even these overstated figures are much smaller than the present values of observed management

fees, which as shown in Table 2 are on average 11.65% of committed capital for buyout funds in our data and reach 14.65% at the 75^{th} percentile (Metrick and Yasuda (2010a) report similar statistics).[20] Further, the standard deviation of observed fees in our data is 3.81% of committed capital. Thus, the *variation* in observed fees is greater than even the *average* of unobserved fees. Given these differences, it seems unlikely that variation in unobserved fees would be both large enough and correlated strongly negatively enough (see below) with observed fees to overturn our conclusions.

Similarly, Metrick and Yasuda (2010a) report that the most common carried interest scheme for venture capital funds (20% with a basis of committed capital, with carry earned when contributed capital is returned) results in 8.33% of committed capital as expected revenue to the GP from carried interest. Changing the basis to investment capital results in an estimate of 9.40% and changing the timing rule to require all committed capital returned changes the estimate to 8.27%. These are the types of differences we do not observe, and they are small relative to the differences that result from changing the carried interest percentage which we can and do observe. From the base 8.33%, changing the carried interest percentage to 25% (30%) changes the estimate to 10.40% (12.47%). They report similar statistics for buyout funds. Thus the carried interest percentage, which we do observe, is the dominant factor driving expected revenue from carried interest.

Moreover, it is the correlation between observed and unobserved fees that drives the sign of any potential bias. If as seems most likely the correlation is positive, so that funds that charge high management fees also charge high fees to portfolio companies, then the conclusions of Table 4 would be unchanged, since it would continue to be the case that high fee funds earned sufficiently higher gross returns that their net-of-fee returns were not lower than lower fee funds. For the fee/performance results of Table 4 to be overturned, it would have to be the case that unobserved fees were sufficiently negatively correlated with observed management fees that the rank ordering of funds would be distorted: it would have to be the case that funds that we observe to be low-fee funds would have such high unobserved

[20]he 2012 10-K filings of Blackstone and KKR corroborate these differences. Blackstone reports (p. 92) 2012 base management fees of $348,594,000 and "transaction and other fees" of $100,080,000, so the latter is 28.7% of the former. For KKR (from the "private markets" segment data, p. 210) the analogous percentage is 27.3%. Given the prominence of these partnerships, it is likely they charge among the highest transaction and monitoring fees in the industry.

fees that they are actually high-fee funds, and vice versa.

While we cannot test this directly, our discussions with industry practitioners and experts suggests that this correlation is not large and negative but rather small and positive, and that most of the variation in unobserved fees (and carry rules) follows industry cycles and so occurs at the vintage-year level, not cross-sectionally within vintage years. This type of variation poses no problem to our conclusions because it is absorbed by the vintage year fixed effects in Table 4. Variation in hidden fees that is correlated with our other controls (such as fund size) is also captured by those controls. Even if observed and unobserved fees were negatively correlated in the cross-section within a vintage year, given the relative magnitudes discussed above, it seems unlikely that the amount of variation in unobserved fees that is missed by our controls would be large enough to significantly distort the rank-ordering of funds by fees. Moreover, we obtain consistent results for both venture capital and buyout funds even though venture capital funds do not charge such fees.

Similar logic applies with respect to omitted carry timing information and the relations between carried interest and performance. Nevertheless, our results should be interpreted bearing in mind the caveat that we cannot, of course, completely rule out confounding effects of unobserved fees.

Another issue concerns the possibility of side agreements between the GP and selected LPs. We know of no systematic evidence on the contents of side letters. To the extent such agreements concern fees, we believe that it is most likely that the funds that offer discounts to certain investors are those that are high-fee by our measures, under the logic that a low-fee fund is more likely to already be competitive on price. This would reinforce the conclusion that high-fee funds are not a bad deal for investors, because they would reap both the performance we report and the discount.

A final issue concerns co-investments, whereby a GP invites an LP to invest directly in a portfolio company alongside the funds. Co-investments are a way to reduce an LP's fee bill as a percentage of total dollars allocated to private equity investments. Our analysis is about the fees paid to funds on the capital invested directly in the funds. We do not have data on an LP's overall fee bill from investing in private equity, which includes co-investments, investments in funds-of-funds, and in-house investments. To the extent that high-fee funds

use co-investments to lower the effective fee bill (as a percentage of total capital in private equity investments), this strengthens our conclusions that high-fee funds are not a bad deal for investors.

D. Contract Terms and Cash Flow Cyclicality

It is possible that the analyses of the relations between contract terms and performance miss important differences in the systematic riskiness of the funds that are related to contract terms, despite the robustness of the results to tailored and levered PMEs that are designed to partially address this concern. In particular, funds with higher compensation may have higher betas, and this could potentially explain why these funds have higher gross returns relative to public equity benchmarks. Presumably, LPs would prefer for higher compensation and incentives to translate into more effort to add value (i.e., generate alpha), or be more reflective of the ability to do so, as opposed to simply translating into greater systematic risk-taking. These considerations are closely related to the general question in delegated asset management settings of how managerial compensation and incentives impact effort to generate alpha as opposed to loading up on beta.

As noted above in Section IV.B, reliably estimating betas at the fund level is difficult, and no accepted method to do so exists in the literature. However, the behavior of cash flows to and from limited partners allows us to offer some insights into these questions. Holding the magnitude of calls and distributions constant, a fund that is more likely to call capital in bad times and distribute capital in good times will have a higher covariance of cash flow returns with the market return compared to a fund whose call and distribution behavior is unrelated to broader market conditions.[21] Consequently, we can check whether funds with higher compensation or lower ownership are likely to be taking on greater systematic risk by asking whether the comovement of their net cash flows (distributions minus calls) with public market conditions is a function of contractual terms.

The analysis is presented in Table 5. The dependent variable is a fund's quarterly net cash flow (as a percentage of fund size). All specifications include fund age fixed effects (measured

[21] Put differently, a systematic tendency to call capital in bad times when it is costly for LPs to provide it, and to distribute capital in good times when it is less valuable because other investments are paying off as well, suggests greater systematic riskiness from an LP's perspective.

in calendar quarters) to control for differing unconditional propensities to call and distribute capital across funds of different age. Standard errors are clustered by calendar quarter, and conclusions are robust to clustering by fund or by both fund and quarter. Panel A considers buyout funds, while Panel B focuses on VC funds.

The main explanatory variable of interest is "ln(P/D)", the natural logarithm of the Price/Dividend ratio on the S&P 500 (from Robert Shiller's website), which captures public market valuation levels. We also include the log of Baa-Aaa yield spread (from Datastream), orthogonalized with respect to the log of P/D, to assess sensitivity to debt market conditions unrelated to equity market valuations. We also control for the fund's uncalled capital as a percentage of its committed capital, a measure of a fund's dry powder. All of these explanatory variables are lagged one quarter, so these are predictive regressions.

We are interested in how the loadings of net cash flows on these variables, particularly P/D, vary with contract terms. To that end, the first specification in each panel interacts the explanatory variables with the present value of lifetime management fees, the second with the carried interest percentage, and the third with GP percentage ownership. We also include the respective contract terms as explanatory variables themselves. This assures that we account for any differences in the magnitude of cash flows that are associated with the contract terms. In other words, the specifications hold the magnitude of cash flows fixed across the contract terms of interest. Because we demean all contract terms in these specifications, the coefficients on P/D and the yield spread measure the sensitive of cash flows to these variable for a fund with fees, carry, and ownership equal to the sample average, while the interaction terms measure how these sensitivities vary with the contract terms.[22]

The results are easy to summarize, because there is no evidence that any contract term is associated with the sensitivity of net cash flows to public equity market valuations (P/D). In particular, there is no evidence that funds with high management fees or carry, or low GP ownership, display greater cash flow co-movement with public equity markets. Nor is

[22]Our conclusions are unaffected by instead using indicator variables for whether management fee is above the fund-type specific median, for whether the carry is less than, equal to, or greater than 20%, and for whether GP ownership is less than 0.99%, greater than 1.01%, or in between. Further, while the specifications in Table 5 include all cash flow observations, conclusions are unaffected by restricting the call specifications to observations where the fund has some uncalled capital, and restricting the distribution specifications to observations for which some capital has previously been called. Conclusions are also unaffected by examining calls and distributions separately.

there evidence that such funds have a higher co-movement of cash flows with favorable debt market conditions (in fact for low-GP ownership buyout funds the opposite is true).

Overall, then, the results suggest that it is unlikely that private equity funds with higher compensation earn back their fees by taking more systematic risk.[23] This is true even with respect to the carried interest that one might worry would create systematic risk-taking (as opposed to effort-providing) incentives. Instead, the evidence is more consistent with the interpretation that managers of such funds add more value.

E. Compensation, Ownership, and Performance Over Fundraising Cycles

Concerns about excessive fees, misaligned incentives, and diseconomies of scale are especially acute in boom times, when fund sizes grow and compensation rises, shifts to fixed components, and becomes more front loaded (cf. Table 3). In the face of large, certain, and immediate fee income, critics suggest that performance incentives are inadequate. While the cross-sectional tests in Table 4 show that high-compensation or low-ownership funds do not underperform in the cross-section of funds raised at a point in time, those tests do not address whether high-compensation or low-ownership funds raised in boom times underperform.

Table 6 takes up this issue, with Panel A focusing on buyout funds and Panel B on venture capital funds. In each panel, the performance measure used as the dependent variable is PME in first three specifications, tailored PME in the next three, and levered PME in the final three. The key explanatory variables are the interactions of contract terms with ln(Industry Flows), which measures market-wide fundraising conditions when the fund is raised. Given this focus, we do not include vintage year fixed effects. In specifications (1), (4), and (7), the contract term is PV Lifetime Fees. In specifications (2), (5), and (8), it is the carried interest percentage, and in specifications (3), (6), and (9), it is the GP ownership stake.[24]

[23] Another way to evaluate risk that may be appropriate given the GP's option-like compensation structure, is to evaluate the standard deviation of performance in a loss region. We find no evidence that among funds with PME less than one, higher-fee funds have a greater cross-sectional standard deviation of PME.

[24] In Table 6, we focus on the full sample of funds because many buyout funds from the most recent boom have not yet liquidated by the end of the sample period. Results are similar in the liquidated sample. Also, in Table 6, we include the contract terms as continuous (demeaned) variables. Results are similar using instead indicator variables for whether the management fee is above the fund-type specific median, for whether the carry is less than, equal to, or greater than 20%, and for whether GP ownership is less than 0.99%, greater than 1.01%, or in between. The conclusions of Table 7, presented below, are also robust to all of these

Panel A shows that high-management fee buyout funds raised in boom times actually outperform, not underperform. The interaction coefficient of 0.01 indicates that a one percentage point increase in PV Lifetime Fees is associated with a one percent increase in PME for every doubling of Industry Flows. This conclusion holds across all three performance measures. At the same time, the levered PME results suggest that high-carry buyout funds raised in boom times underperform, though the result is only marginally significant and not robust to the PME and tailored PME specifications. There is no evidence of an association between buyout performance and the interaction of GP ownership and fundraising cycles.

Turning to venture capital funds in Panel B, there is no evidence of underperformance among high-management fee or low-ownership VC funds raised in boom times. There is, however, robust evidence that high-carry VC funds raised in boom times underperform. A caveat is that because we potentially lack data on the funds raised in boom times by the very best venture capital partnerships, which are likely to have high carry, the results may not generalize to such partnerships.

F. Compensation, Ownership, and Performance in the Cross-Section of Fund Size

Closely related to concerns about boom-time excesses are concerns about excesses in large funds. Metrick and Yasuda (2010a) find that larger funds have proportionally fewer managing partners tasked with deploying the capital, particularly in the buyout industry, leading to concerns over a combination of misaligned incentives and diseconomies of scale. As with the boom-time concerns discussed in the previous subsection, a common critique leveled at large private equity funds is that large and certain fee income dilutes performance incentives, especially considering that fee income per partner grows faster than fund size (Metrick and Yasuda, 2010a).

Accordingly, in Table 7 we examine whether large funds, particularly large funds with high compensation or low ownership, underperform. As before, there is no statistically reliable evidence that larger funds underperform. Nor is there any evidence that large funds with high management fees or low GP ownership underperform.

However, there is evidence that large, high carry funds underperform, for both buyout and venture. At the same time, buyout funds with high carry outperform unconditionally,

with a one percentage point increase in carry percentage associated with a 0.05 improvement in PME (representing an extra 5% return over the life of the fund). Thus, for buyout funds, these results indicate that unless they are extremely large, high-carry buyout funds do not underperform per se. Rather, large, high-carry buyout funds do not outperform by as much as their smaller, high-carry counterparts.

G. Summary and Discussion

Overall, the evidence in Tables 4-7 provide only very limited support for the view that management contracts in private equity are inefficient. The main evidence in favor of this view is the fact that high-carry venture capital funds underperform when they are large or raised in boom times.

For the most part, however, GP compensation and ownership is unrelated to the funds' cash flow performance, and most significant relations oppose the inefficiency view. High-carry and low-GP ownership buyout funds outperform, the opposite of the inefficiency prediction. Further, there is no evidence for the common critique that large, certain, and immediate fee income reduces performance. High-management fee funds do not underperform in the overall cross-section, nor in boom times, nor among large funds.

The evidence is most consistent with the view that management contracts in private equity are more or less efficient, whereby variation in compensation and ownership reflects variation in GP skill, agency concerns, and the demand for GP services. The evidence is broadly consistent with a Berk and Green (2004) type of equilibrium in which GPs largely capture the excess returns they generate.

V. Compensation Incentives and Cash Flow Behavior

The historical evidence presented thus far indicates that, on average, compensation practices in private equity have not been so distorted that low-ability GPs are able to charge high fees and subsequently underperform. This does not mean, however, that agency tensions between GPs and LPs cannot be observed in the data. As Jensen and Meckling (1976) emphasize, agency costs are an unavoidable part of an agency relationship, and even efficient

contracts typically do not drive such costs to zero. In private equity, agency conflicts exist largely because GPs possess private information about both the underlying quality of their investments at a particular point in time, as well as their ability to exit the investments over a given time-frame at a particular price. This information asymmetry allows GPs to potentially game the timing of their exits to incentives embedded in contractual provisions that have the primary purpose of protecting the LP's return.

In this section, we investigate two such issues that are frequently cited by practitioners and in the popular press. We first examine the clustering of distributions around "waterfall" dates for earning carried interest, and then turn to the question of "zombie funds", whereby funds with management fees based on net invested capital have incentives to delay distributions on "living dead" investments to continue earning management fees on those investments. As we will see, the evidence supports both of these concerns.

A. Distribution Clustering around Carried Interest Waterfalls

The first issue concerns the timing of distributions around the threshold for earning carried interest. In general, GPs earn no carried interest until a certain basis (usually, contributed capital to date) plus a preferred (hurdle) return is first distributed to LPs. While it is clearly desirable for LPs that they receive "their money back" before GPs earn any profit-sharing, a potential, and less desirable, side-effect concerns the behavior of GPs once this "waterfall" for earning carried interest is crossed. Specifically, practitioners emphasize the incentive for the GP to time distributions so that they cluster at and just after the waterfall date. By doing so, the GP earns immediate carried interest on those distributions, and avoids the risk that the investments might later decline in value. The problem is that this behavior will lead some investments to be harvested too early, when delaying would have generated more value for LPs.[25] One practitioner characterized these incentives to us as: "Once you reach the waterfall, it's time to turn on the vacuum cleaner".

Despite anecdotal accounts, there exists no systematic evidence on whether GPs in fact behave this way. While we cannot observe the counterfactual of what would happen to

[25]These issues are related to the "grandstanding" incentives explored by Gompers (1996), by which GPs have incentives to exit investments too early to aid in raising their next fund.

performance if GPs held investments for longer or shorter than they actually do, we can test for whether distributions cluster around the waterfall date. Such clustering would be difficult to rationalize as an innocuous response to changes in exit opportunities, because there is no reason – other than the GP's particular incentives – why the attractiveness of an exit would spike around waterfall dates.[26]

As discussed in Section IV.C, we do not know the specific carry timing rules for our sample funds. Therefore, we examine distribution behavior around waterfall dates implied by what Choi, Metrick, and Yasuda (2011) report is the most common carried interest timing scheme. In this scheme, GPs begin to earn carried interest (the waterfall occurs) once the LPs receive back, in the form of distributions from exited investments, all of the capital they had previously contributed to the fund (including both capital contributed for investments and management fees paid), plus a preferred return. In buyout, this preferred return is almost always 8% annualized, while venture contracts rarely have a preferred return, so the threshold is simply the return of contributed capital. This scheme is known as a "European"-style waterfall. The threshold is sometimes committed capital rather than contributed capital, but in practice this makes little difference because few funds reach profitability on contributed capital before almost all committed capital is called.

Another common waterfall rule is the "U.S."-style one, whereby only capital contributed for realized investments must be returned before carried interest is earned. While assuming that the "European" waterfall date applies to such funds is not technically correct, those funds' incentives to lock-in carry will be strongest once all contributed capital is returned. The reason is that at that point the fund tends to be profitable overall and so there is no possibility that the carry, once locked in, can be clawed back. Whereas, the GP would have less of an incentive to distort exit decisions earlier because the carry earned from doing so could be clawed back if the fund subsequently underperforms. To the extent this is true, assuming the European scheme applies to such funds ends up correctly identifying the point in time in which incentives to distort exit behavior are strongest. Moreover, if the waterfall implied by the "European" scheme is not relevant for some funds, the resulting noise in our

[26]Waterfall dates vary considerably across funds in calendar time, so systematic patterns in behavior around waterfall dates are unlikely to be driven by market conditions.

estimates biases the tests against finding an effect.

Table 8 presents the tests. The tests include only the 54% of buyout funds and 42% of venture capital funds that actually cross the waterfall threshold at some point in the fund's life. The dependent variable is a fund's quarterly distributions (as a percentage of fund size). The unit of observation is a fund-calendar quarter. Standard errors are clustered by fund. Clustering by calendar quarter or by both fund and calendar quarter yields similar results. Estimation is OLS for ease in interpreting the coefficients, but Tobit specifications that account for left-censoring at zero yield similar results.

The tests include only quarters in the [-4, +8] interval around the quarter in which the waterfall threshold is crossed (inclusive), to focus cleanly on behavior around the waterfall date. The key explanatory variables are indicator variables for whether the quarter in question is the waterfall quarter, whether it is 1-4 (inclusive) quarters after the waterfall quarter, and whether it is 5-8 (inclusive) quarters after the waterfall quarter. Thus, the omitted category is whether the quarter in question is in the [-4, -1] interval before the waterfall quarter.

If funds cluster distributions around the waterfall, we expect a positive and significant coefficient on the waterfall quarter indicator, indicating higher distributions in that quarter relative to the four prior quarters. We also expect distributions to be higher compared to the pre-waterfall period in the 1-4 quarters after the waterfall quarter, and for this to decline subsequently (in the period 5-8 quarters after the waterfall). That is, we expect a hump-shaped pattern of distributions, with a peak around the waterfall date.

The evidence in Table 8 strongly supports agency concerns that funds cluster distributions around the waterfall date. In column (1), we see that distributions in the waterfall quarter are 47.72% of fund size higher on average than the average quarterly distribution in the four pre-waterfall quarter.[27] In the period 1-4 quarters after the waterfall is met, distributions are on average 3.25% of fund size larger than the average for the four pre-waterfall quarters. In the period 5-8 quarters after the waterfall is met, distributions are on average 2.97% of fund size smaller than the average for the four pre-waterfall quarters.

Of course, one concern is that the large distributions in the waterfall quarter may simply

[27]Unlike capital calls, distributions are not capped at 100% of fund size.

be an artifact of the best-performing funds, whose distributions are larger on average. To address this concern, Column (2) includes a control for the fund's total distributions over its life, and Column (3) includes fund fixed effects to focus purely on time-series variation in distributions within a fund. These fixed effects subsume all time-invariant observed or unobserved variation at the fund level, such as the aforementioned total distributions of the fund, the fund's vintage year, etc. The results are robust. Further, Columns (4)-(9) repeat the analysis for buyout and venture capital funds separately. The general patterns hold for both types of funds, though the coefficient on the period 1-4 quarters after the waterfall is not significant (though still positive) for buyout funds.

Finally, in untabulated robustness checks, we confirm that the results are robust to splitting the sample into funds that reach the waterfall before and after they are seven years of age, and to including calendar quarter fixed effects to control for systematic shocks to exit opportunities.

B. Zombie Funds and Living Dead Investments

The second issue concerns the incentive for funds to delay liquidating poorly performing "living dead" investments. This can result in so-called "zombie funds" who hold ongoing investments with little hope of a profitable exit. These incentives arise when the fund's management fee basis changes to be based on net invested capital (total equity investments minus the cost basis of realized, exited investments) at some point in the fund's life. The intent of such rules is for LPs to avoid paying GPs management fees on investments they are no longer managing. Clearly, this is good from the LP's perspective, and our data show that lifetime management fees are indeed lower among such funds. At the same time, such rules mean that exiting unprofitable investments and returning the modest proceeds to LPs will reduce the base of capital on which the GPs earn management fees, giving them the incentive to delay doing so.

While this issue has received particular attention among private equity critics[28], there is no systematic evidence on whether GPs actually behave this way. Because we do not have information on underlying portfolio companies, we do not know whether any given distribu-

[28]See for example "Private Equity Trapped in 'Zombie Funds'", The Financial Times, December 11, 2011.

tion in the data is associated with a profitable or an unprofitable investment. However, we can test whether funds that have this kind of management fee basis shift do in fact tend to have distributions later in life compared to funds without such management fee provisions. Such a finding would be consistent with "zombie fund" concerns.

Table 9 presents tests. The dependent variable is a fund's quarterly distribution as a percentage of fund size. Results are robust to using instead an indicator for whether the fund has a distribution in a given quarter. The unit of observation is a fund-calendar quarter. Standard errors are clustered by fund. Clustering by calendar quarter or by both fund and quarter yield similar results. Estimation is OLS for ease in interpreting the coefficients, but Tobit (Panel A) and probit (Panel B) specifications yield similar conclusions. We include vintage year fixed effects to control for market-wide factors that might influence the size and timing of distributions (for example, the existence of favorable IPO markets for exiting investments) in the cross-section of funds.

The key explanatory variable is an indicator for whether the fund in question has a fee basis change that gives rise to "zombie fund" concerns, interacted with (the natural logarithm of) the age of the fund, measured in calendar quarters. A positive coefficient on this variable indicates that distributions occur later in life for funds with such a management fee basis change, consistent with the concerns outlined above.[29]

Columns (1)-(3) of both panels of Table 9 focus on all funds pooled together. Column (1) shows that the coefficient on the key interaction is indeed significantly positive. Column (2) addresses concerns that this result may be due to systematic differences in overall fund performance across funds who do and do not have a fee basis change (despite the fee/performance results in previous sections), by including controls for the fund's final PME and the fund's total lifetime distributions as a percentage of fund size. Column (3) further address such concerns by including fund fixed effects to focus on time-series variation in distribution behavior within a fund. The results are robust.

[29]It would potentially also be consistent with the notion that funds that expect to make longer-term investments are more likely to have a fee basis change to invested capital. However, the impact of such a change on total fees paid would be smaller for such funds (as invested capital is closer to committed capital for a longer period of time) so it is equally plausible that a fee basis change is more likely in funds that are expected to have shorter-term investments. Indeed, venture capital investments tend to be longer lived than buyout ones, yet our data show that buyout funds are more likely to have a fee basis change to invested capital.

Columns (4)-(6) and (7)-(9) repeat the analysis, focusing on buyout and venture capital funds, respectively. These columns reveal that the overall results are largely driven by buyout funds. While the key interaction coefficient is positive in all specifications for venture capital funds, it is generally insignificant.

VI. Conclusion

We use a large, proprietary database of private equity funds to study the links between the terms of private equity management contracts and the subsequent cash flow behavior and performance of the funds. The database is the largest and most recent source of private equity compensation terms available to date, and is the first to provide information on manager ownership and to include cash flow information along with the terms of management contract.

We use these data to contrast two views of the state of managerial compensation practices in private equity. The first is that highly compensated GPs, or those with little "skin in the game", extract excessive rents and have inadequate incentives, which ultimately spells poor returns for limited partners. The second view is that the management contracts we observe reflect (potentially constrained) efficient bargaining outcomes between sophisticated parties, and that management contracts reflect the productivity of GP skills and the agency problems that LP's face.

The evidence in this paper supports the latter view. To be sure, during fundraising booms, percentage management fees increase and GP's compensation shifts toward the fixed component, consistent with greater GP bargaining power and a preference for fixed compensation. Moreover, GPs who receive fees on invested capital tend to exit investments (and thus lower their fee basis) more slowly, while GPs tend to accelerate the pace of exit immediately after they become eligible to receive carried interest. These findings indeed suggest that the fundamental information asymmetry between GPs and LPs allows GPs to game the contractual provisions that are partially in place to protect the LP's return, and they certainly illustrate that GP's earn more in boom periods. However, we find no evidence that high-fee funds underperform an on a net-of-fee basis. Management fees and carried interest are generally unrelated to net-of-fee cash flow performance. This suggests that private equity

GPs that receive higher compensation earn it in the form of higher gross returns. When we examine the relation between GP ownership and performance, our evidence flatly contradicts the argument that GPs with low skin in the game demonstrate poor performance.

Our results on the relation between fees and net-of-fee performance in private equity stand in marked contrast to what is known about the mutual fund industry. There, net-of-fee performance is strongly negatively correlated with management fees. Of course, limited partners who invest in private equity are different from mutual fund investors in a number of important respects. First, because they are typically large institutions committing large sums of capital, they presumably are more sophisticated than most retail investors. But perhaps more importantly, the inability to withdraw their commitments without incurring substantial costs creates much stronger incentives to screen GPs ex ante and to guarantee that management contracts optimally reflect their agency concerns. In this regard, private equity investors also differ from investors in hedge funds, who are able to withdraw their capital periodically, with advance notice given to the fund. Our results suggest that understanding how monitoring, oversight and the matching process between LPs and GPs affect the equilibrium effort and performance of intermediated capital is an important question for future research.

Appendix

In this Appendix we describe the calculation of lifetime management fees and their present value. For the 454 sample funds (60.1%) whose fee basis is committed capital and never changes throughout the life the of the fund, these calculations are straightforward. Expected dollar management fees for each year are obtained by applying the fee percentage in effect for that year to the fund's committed capital (in 257 of these 454 funds, the fee percentage is constant over time as well).

For the 8% of funds whose initial fee basis is not committed capital, and the 33% of funds whose basis changes at some point, assumptions are needed to calculate expected fees for years in which the basis is not committed capital. Following Metrick and Yasuda (2010a), we assume that capital calls for investments are expected to be made over the first 5 years of a fund's life. For VC funds, the expected investment pace is 39%, 18%, 15%, 16%, and 12% in years one through five, respectively. For buyout funds, it is 22%, 22%, 20%, 19%, and 17%. These expected investment paces are equal to the actual empirical size-weighted average investment paces for our sample funds (based on our cash flow data) – Metrick and Yasuda (2010a) use similar investment paces derived from a different sample of funds. Again following Metrick and Yasuda (2010a), we assume that investments are exited following an exponential distribution with parameter 0.2 (corresponding to an average five year holding period).

Using these assumptions, we forecast the expected invested capital (total equity capital invested in portfolio companies to date) and net invested capital (invested capital minus the cost basis of realized investments) for each year. Together with committed capital, these are the most common fee bases. Further, the most common basis changes are from committed capital to net invested capital or (less frequently) invested capital. In a few rare cases, the initial or later fee basis is "net asset value" rather than committed capital, invested capital, or net invested capital. In these cases we assume that investments are valued at cost, which results in an effective basis of net invested capital. In a few other rare cases, the initial or new fee basis is committed capital less the cost basis of realized investments. We forecast this basis and compute expected fees in these cases using the same investment and exit

assumptions laid out above.

With these forecasts, we then obtain expected annual management fees by applying the percentage fee for each year to the applicable forecasted fee basis for that year (reflecting changes in fees and bases when they are scheduled to occur). Lifetime fees and their present value then follow immediately. Metrick and Yasuda (2010a) provide further discussion and numerical examples of calculating lifetime fees in this way.

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Table 1: Sample Summary

This table presents summary statistics for the venture capital (VC) and buyout (BO) private equity funds in our sample. Fraction of 1st, 2nd, and 3rd funds indicates the fraction of sample funds of that sequence number (position in a partnership's sequence of funds). Total Committed Capital is the aggregate amount of capital committed to our sample funds (i.e. the sum of the sizes of all sample funds). Total LP Capital and Total GP Capital indicate, respectively, the contributions of limited partners and general partners to this total. The % of VE universe is the total committed capital of the sample funds of a given fund type expressed as a percentage of the total committed capital to all funds of the same type reported on Venture Economics over the entire 1984-2009 sample period. The % of VE U.S. universe includes only U.S. funds. Fund Size is the committed capital of the fund. All dollar amounts are in millions of US dollars.

	All Funds	Venture Capital	Buyout
Number of Funds	837	295	542
Fraction of 1st Funds	0.30	0.25	0.32
Fraction of 2nd Funds	0.24	0.26	0.23
Fraction of 3rd Funds	0.16	0.15	0.16
Total Committed Capital	$596,843	$61,358	$535,485
Total LP Capital	$585,745	$60,469	$525,276
Total GP Capital	$11,088	$879	$10,209
% of VE universe	26.5%	10.8%	41.6%
% of VE U.S. universe	34.4%	15.9%	55.7%
Mean Fund Size ($M)	713.06	207.96	987.98
Median Fund Size ($M)	204.34	106.12	312.91
St. Dev. Fund Size ($M)	1887.61	276.26	2291.21

Table 2: Summary Statistics on GP Compensation and Ownership

Panel A contains summary statistics on management fees, carried interest and GP ownership (capital commitments) for the full sample of 837 funds. The initial fee percentage is the annual percent management fee at the fund's inception (i.e., the percentage fee for the first year of the fund's life); the initial fee basis is the basis to which this percentage is applied. Fee % Changes and Fee Basis Changes are indicator variables for whether the initial fee percentage or basis ever change over the fund's life. Lifetime fees is the total expected management fees earned over the life of the fund (see Appendix for calculation details). PV Lifetime fee is the present value of the lifetime fees discounted by the 10-year Treasury rate in effect at the end of the fund's vintage year. Management fee information is available for 755 of the 837 sample funds, and 491 of the 560 liquidated funds. Carried interest is the GP's profit participation. The GP ownership is the GP's commitment of its own capital to the fund, above and beyond the profit claim from carried interest.

		All Funds	Venture Capital	Buyout
Management Fees:				
Initial Fee (% per year):	Mean	1.94	2.24	1.78
	Median	2.00	2.50	2.00
	St. Dev.	0.49	0.41	0.45
Lifetime Fees (% of fund size):	Mean	16.54	20.37	14.49
	Median	16.50	21.38	14.23
	St. Dev.	5.60	4.46	5.05
PV Lifetime Fees (% of fund size):	Mean	13.17	16.01	11.65
	Median	13.53	16.69	11.52
	St. Dev.	4.21	3.37	3.81
Fraction with:				
	Initial Fee = 1.5%	0.17	0.05	0.23
	Initial Fee = 2.0%	0.37	0.26	0.43
	Initial Fee = 2.5%	0.21	0.46	0.07
	Initial Fee Basis = Committed Capital	0.92	0.94	0.92
	Fee % Changes	0.45	0.53	0.40
	Fee Basis Changes	0.33	0.14	0.43
	Either Fee % or Fee Basis Changes	0.59	0.61	0.59
	Both Fee % and Fee Basis Change	0.18	0.06	0.24
Carried Interest:				
Mean Carry (%)		20.13	20.44	19.96
Median Carry (%)		20.00	20.00	20.00
St. Dev. Carry (%)		1.49	1.70	1.33
Fraction with Carry = 20%		0.94	0.89	0.97
Fraction with Carry < 20%		0.02	0.01	0.02
Fraction with Carry > 20%		0.05	0.10	0.01
GP Ownership:				
Mean GP Ownership (% of fund size)		2.17	1.78	2.38
Median GP Ownership (% of fund size)		1.00	1.00	1.00
St. Dev. GP Ownership (% of fund size)		5.51	5.09	5.73
Fraction with GP Ownership between 0.99% - 1.01%		0.42	0.56	0.35
Fraction with GP Ownership < 0.99%		0.21	0.18	0.23
Fraction with GP Ownership > 1.01%		0.37	0.26	0.43

Table 3: The Determinants of Management Fees, Carried Interest, and GP Ownership

This table presents cross-sectional fund-level OLS estimates of the relations between general partner management fees (Panel A), carried interest (Panel B), GP ownership (Panel C), and other fund characteristics. In Panel A, the dependent variable is the present value of the lifetime management fees for the fund, expressed as a percentage of fund size (committed capital). In Panel B, the dependent variables is the carried interest percentage. In Panel C, the dependent variable is the GP's ownership in the fund, expressed as a fraction of fund size. These dependent variables are defined and summary statistics are provided in Table 2. Industry Flows is total capital committed to all funds of the same type (venture capital or buyout) raised in the fund's vintage year (data from Venture Economics). Fund Size is the fund's committed capital (in $ M). Fund No. is the fund's sequence number (its position in a partnership's sequence of funds). Vintage year (i.e., year of fund start) fixed effects are included in Columns (3) and (6). Columns (1)-(3) of each panel are estimated on the buyout sample, columns (4)-(6) on the venture sample. Estimation is OLS in Panels A and B, and fractional logit in Panel C. A constant is estimated in each specification but not reported. Standard errors (in parentheses) are robust to heteroskedasticity and clustered at the partnership level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Columns (1)-(3): Buyout Funds			Columns (4)-(6): Venture Capital Funds		
Panel A: Dependent Variable is Present Value of Lifetime Fees (% of fund size)						
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Industry Flows)	0.44***	0.71***		0.41***	0.58***	
	(0.15)	(0.16)		(0.15)	(0.18)	
ln(Fund Size)		-1.15***	-1.12***		-0.85***	-0.69**
		(0.15)	(0.16)		(0.31)	(0.29)
ln(Fund No.)		0.22	0.34		0.87*	0.70*
		(0.33)	(0.33)		(0.47)	(0.41)
Vintage Year FE?	No	No	Yes	No	No	Yes
Observations	491	491	491	264	264	264
R^2	0.03	0.18	0.22	0.04	0.08	0.17
Panel B: Dependent Variable is Carried Interest (%)						
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Industry Flows)	0.02	0.02		0.16***	0.02	
	(0.04)	(0.03)		(0.05)	(0.05)	
ln(Fund Size)		0.07	0.13*		0.35***	0.32***
		(0.06)	(0.08)		(0.12)	(0.12)
ln(Fund No.)		-0.16	-0.18		0.58***	0.63***
		(0.15)	(0.16)		(0.20)	(0.22)
Vintage Year FE?	No	No	Yes	No	No	Yes
Observations	542	542	542	295	295	295
R^2	0.00	0.01	0.08	0.03	0.17	0.20
Panel C: Dependent Variable is GP Ownership as a Fraction of Fund Size						
	(1)	(2)	(3)	(4)	(5)	(6)
ln(Industry Flows)	-0.01			0.17		
	(0.07)			(0.16)		
ln(Fund Size)	-0.01	-0.05	0.74*	-0.60*	-0.66*	-3.23** *
	(0.05)	(0.06)	(0.30)	(0.35)	(0.37)	(1.35)
ln(Fund Size)^2			-0.07**			0.28**
			(0.03)			(0.12)
First Fund Indicator	0.42**	0.28	0.27	-0.66	-0.77	-0.84
	(0.21)	(0.18)	(0.18)	(0.46)	(0.52)	(0.53)
Vintage Year FE?	No	Yes	Yes	No	Yes	Yes
Observations	542	542	542	295	295	295
Pseudo-R^2	0.01	0.03	0.04	0.04	0.05	0.07

Table 4: Compensation, Ownership, and Cash Flow Performance

This table presents cross-sectional fund-level OLS estimates of the relations between final fund performance, net of all management fees and carried interest, and the terms of the fund management contract. In specifications (1)-(2), the dependent variable is the fund's final PME with respect to the S&P 500 ("PME"). In specifications (3)-(4), the dependent variable is the fund's final PME with respect to its tailored index ("Tailored PME"). The tailored index is the Nasdaq for VC funds, and the Fama-French small, medium, and large size-tercile portfolios for small, medium, and large buyout funds, respectively. In specifications (5)-(6), the dependent variables is the fund's "levered PME", as defined in Robinson and Sensoy (2011). The levered PME adjusts the PME calculation to allow for a beta not equal to one. We use a beta of 1.3 for buyout funds and 2.5 for VC funds, consistent with recent estimates in the literature. "GP Ownership High" and "GP Ownership Low" are indicator variables for whether the GP commitment is greater than 1.01% of fund size or less than 0.99% of fund size, respectively. All other variables are defined in previous tables. PV Lifetime Fees is dummied out for funds without management fee information or without pre-specified fees. The dummy variable is insignificant and not reported. Panel A uses the full sample, while Panel B uses only the sample of liquidated funds. All specifications include vintage year fixed effects. A constant is estimated in each specification but not reported. Standard errors (in parentheses) are robust to heteroskedasticity and clustered at the partnership level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable:	PME		Tailored PME		Levered PME	
	(1)	(2)	(3)	(4)	(5)	(6)
PV Lifetime Fees	-0.01	0.02	-0.01	0.01	-0.01	0.02
	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)
Carried Interest (%)	0.04**	-0.01	0.04***	-0.04	0.03**	-0.04*
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
GP Ownership High	0.10	-0.22	0.10*	-0.21	0.10*	-0.22
	(0.06)	(0.14)	(0.06)	(0.14)	(0.06)	(0.14)
GP Ownership Low	0.20***	-0.15	0.22**	-0.04	0.20***	-0.10
	(0.07)	(0.16)	(0.09)	(0.20)	(0.07)	(0.20)
ln(Fund Size)	-0.02	-0.02	-0.01	-0.00	-0.03	-0.03
	(0.02)	(0.07)	(0.02)	(0.07)	(0.02)	(0.08)
ln(Fund No.)	0.02	0.01	0.03	0.03	0.02	0.00
	(0.05)	(0.11)	(0.06)	(0.12)	(0.05)	(0.12)
Sample	BO	VC	BO	VC	BO	VC
Vintage Year FE?	Yes	Yes	Yes	Yes	Yes	Yes
Observations	542	295	542	295	542	295
R^2	0.08	0.13	0.06	0.10	0.10	0.14

Table 5: Compensation, Ownership, and Cash Flow Comovement

This table presents estimates of the sensitivities of fund-level net cash flows to broader market conditions, as a function of the fund's compensation and ownership terms. The dependent variable is a fund's net cash flows (capital distributions minus calls) in a calendar quarter, as a percentage of fund size. The unit of observation is a fund-calendar quarter. Cash flows are between the funds and their limited partners, and are net of all management fees and carried interest. P/D is the price/dividend ratio of the S&P 500, Yield Spread is the Baa-Aaa yield spread, and % Uncalled is the percentage of the fund's committed capital that has not been called, all measured at the end of the preceding calendar quarter. ln(Yield Spread) is orthogonalized with respect to ln(P/D). In specification (1), the contract term analyzed is the present value of lifetime fees (as a percentage of fund size). In specification (2), the contract term is the carried interest percentage, and in specification (3), the contract term is the GP's ownership percentage. All of these variables are demeaned in each specification. Panel A uses only the sample of buyout funds; Panel B uses only the sample of venture capital funds. Estimation is OLS. All specifications include fixed effects for fund age (measured in quarters). Standard errors (in parentheses) are robust to heteroskedasticity and clustered by calendar quarter. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable:	Net Cash Flows (% of Fund Size)		
Contract Term:	PV Lifetime Fee	Carry	Ownership
	Panel A: Buyout Funds		
	(1)	(2)	(3)
Contract Term ×:			
ln(P/D)	0.03	-0.20	0.12
	(0.10)	(0.31)	(0.08)
ln(Yield Spread)	-0.02	-0.20*	-0.05**
	(0.03)	(0.11)	(0.02)
ln(% Uncalled)	0.03**	-0.01	-0.00
	(0.02)	(0.05)	(0.01)
Contract Term	-0.24	1.13	-0.47*
	(0.38)	(1.23)	(0.28)
ln(P/D)	0.71	0.99**	1.05**
	(0.43)	(0.45)	(0.45)
ln(Yield Spread)	-0.52***	-0.61***	-0.59***
	(0.11)	(0.11)	(0.11)
ln(% Uncalled)	-1.05***	-1.15***	-1.12***
	(0.17)	(0.16)	(0.16)
	All specifications include fund age fixed effects		
Observations	19,484	21,684	21,684
R^2	0.09	0.09	0.09
	Panel B: Venture Capital Funds		
	(1)	(2)	(3)
Contract Term ×:			
ln(P/D)	0.09	0.24	0.86
	(0.13)	(0.47)	(0.67)
ln(Yield Spread)	0.01	0.02	-0.06
	(0.03)	(0.09)	(0.05)
ln(% Uncalled)	-0.00	-0.01	-0.17
	(0.02)	(0.07)	(0.13)
Contract Term	-0.37	-1.00	-3.00
	(0.50)	(1.78)	(2.35)
ln(P/D)	4.29**	3.94**	3.90**
	(1.83)	(1.65)	(1.63)
ln(Yield Spread)	-0.74**	-0.69**	-0.72**
	(0.32)	(0.30)	(0.30)
ln(% Uncalled)	-1.75***	-1.52***	-1.56***
	(0.47)	(0.38)	(0.39)
	All specifications include fund age fixed effects		
Observations	11,727	13,029	13,029
R^2	0.06	0.06	0.06

Table 6: Compensation, Ownership, and Performance Over Fundraising Cycles

This table presents estimates of the relations between management fees, carry, and GP ownership terms and fund performance, as a function of private equity fundraising flows. In Columns (1)-(3), the dependent variable is a fund's final PME; in columns (4)-(6), it is the fund's final Tailored PME; in columns (7)-(9), it is the fund's final Levered PME. In specifications (1), (4), and (7), the contract term analyzed is the present value of lifetime fees (as a percentage of fund size). In specifications (2), (5), and (8), the contract term is the carried interest percentage. In specifications (3), (6), and (9), the contract term is the GP's ownership percentage. All the contract term variables, and the ln(Industry Flows) variable, are demeaned in each specification. Definitions for all other variables are provided in the captions to prior tables. Panel A uses only the sample of buyout funds; Panel B uses only the sample of venture capital funds. Estimation is OLS. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by calendar quarter. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable:	PME			Tailored PME			Levered PME		
Contract Term:	PV LF	Carry	GP Own.	PV LF	Carry	GP Own.	PV LF	Carry	GP Own.
Panel A: Buyout Funds									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Contract Term ×									
ln(Industry Flows)	0.01**	-0.01	-0.00	0.01**	-0.01	-0.00	0.01**	-0.01*	-0.00
	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
Contract Term	-0.00	0.05***	-0.00	-0.00	0.05***	-0.00	-0.00	0.05***	-0.00
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)
ln(Industry Flows)	0.03	0.02	0.02	-0.02	-0.02	-0.02	0.06***	0.06***	0.06***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
ln(Fund Size)	-0.03	-0.03	-0.03	-0.01	-0.01	-0.01	-0.03	-0.04	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
ln(Fund No.)	0.02	0.03	0.02	0.03	0.03	0.02	0.02	0.03	0.02
	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)
Observations	542	542	542	542	542	542	542	542	542
R^2	0.02	0.01	0.01	0.02	0.01	0.00	0.04	0.03	0.03
Panel B: Venture Capital Funds									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Contract Term ×									
ln(Industry Flows)	-0.00	-0.04**	-0.01	-0.00	-0.04**	-0.01	0.00	-0.04**	-0.00
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
Contract Term	0.02	0.02	0.02	0.02	-0.01	0.01	0.03	-0.01	0.00
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)
ln(Industry Flows)	-0.03	-0.03	-0.02	-0.01	-0.00	0.01	0.11*	0.12**	0.13**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)
ln(Fund Size)	-0.08	-0.08	-0.10*	-0.06	-0.06	-0.09**	-0.09*	-0.09**	-0.13**
	(0.06)	(0.06)	(0.05)	(0.05)	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)
ln(Fund No.)	0.04	0.04	0.05	0.04	0.05	0.05	0.02	0.03	0.03
	(0.12)	(0.13)	(0.13)	(0.12)	(0.14)	(0.13)	(0.11)	(0.14)	(0.13)
Observations	295	295	295	295	295	295	295	295	295
R^2	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.03	0.03

Table 7: Compensation, Ownership, and Performance in the Cross-Section of Fund Size

This table presents estimates of the relations between management fees, carry, and GP ownership terms and fund performance, as a function of fund size. In Columns (1)-(3), the dependent variable is a fund's final PME; in columns (4)-(6), it is the fund's final Tailored PME; in columns (7)-(9), it is the fund's final Levered PME. In specifications (1), (4), and (7), the contract term analyzed is the present value of lifetime fees (as a percentage of fund size). In specifications (2), (5), and (8), the contract term is the carried interest percentage. In specifications (3), (6), and (9), the contract term is the GP's ownership percentage. All the contract term variables, and the ln(Fund Size) variable, are demeaned in each specification. Definitions for all other variables are provided in the captions to prior tables. Panel A uses only the sample of buyout funds; Panel B uses only the sample of venture capital funds. Estimation is OLS. All specifications include vintage year fixed effects. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by calendar quarter. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable:	PME			Tailored PME			Levered PME		
Contract Term:	PV LF	Carry	GP Own.	PV LF	Carry	GP Own.	PV LF	Carry	GP Own.
Panel A: Buyout Funds									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Contract Term ×									
ln(Fund Size)	-0.00	-0.02**	-0.01	-0.01	-0.01**	-0.00	-0.00	-0.02**	-0.01*
	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
Contract Term	-0.01	0.05***	-0.00	-0.01	0.05***	-0.00	-0.01	0.04***	-0.00
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.00)
ln(Fund Size)	-0.02	-0.02	-0.01	-0.00	-0.01	-0.00	-0.02	-0.02	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
ln(Fund No.)		0.02	0.01		0.02	0.02		0.02	0.01
		(0.04)	(0.04)		(0.06)	(0.06)		(0.04)	(0.04)
				All specifications include vintage year fixed effects					
Observations	542	542	542	542	542	542	542	542	542
R^2	0.06	0.07	0.06	0.04	0.05	0.04	0.09	0.09	0.08
Panel B: Venture Capital Funds									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Contract Term ×									
ln(Fund Size)	-0.01	-0.05*	0.01	0.00	-0.05*	-0.00	-0.00	-0.05*	-0.00
	(0.01)	(0.03)	(0.02)	(0.01)	(0.03)	(0.02)	(0.01)	(0.03)	(0.01)
Contract Term	0.02	0.04	0.02	0.02	0.01	-0.00	0.02	0.00	-0.01
	(0.02)	(0.04)	(0.04)	(0.02)	(0.04)	(0.04)	(0.02)	(0.04)	(0.03)
ln(Fund Size)	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02	-0.08*	-0.04	-0.06
	(0.05)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
ln(Fund No.)		0.02	0.02		0.04	0.03		0.01	-0.00
		(0.13)	(0.13)		(0.14)	(0.13)		(0.13)	(0.13)
				All specifications include vintage year fixed effects					
Observations	295	295	295	295	295	295	295	295	295
R^2	0.13	0.13	0.12	0.10	0.10	0.09	0.14	0.13	0.13

Table 8: Do Funds Cluster Distributions Around the Carry Threshold?

This table presents estimates of whether funds cluster distributions to occur just after the threshold for earning carried interest has been crossed (the "waterfall"). The threshold is calculated using the rule that all called capital, plus a hurdle rate of return, must be returned to LPs before carry is earned. For buyout, the hurdle rate is 8%. For venture capital, there is no hurdle return. Metrick and Yasuda (2010a) document that this is by a considerable margin the most common carried interest scheme employed by private equity funds in practice. The dependent variable is a fund's quarterly distribution to LPs, as a percentage of fund size (committed capital). The unit of observation is a fund-calendar quarter. The independent variables are indicator variables for (i) whether the fund-quarter in question is the quarter in which the waterfall is achieved ("Waterfall Quarter"), (ii) whether the fund-quarter in question lies in the four quarters after the waterfall is achieved ("1-4 Quarters After Waterfall"), and (iii) whether the fund-quarter lies in the four quarters after that ("5-8 Quarters After Waterfall"). "Total Dists" is the total amount of distributions (as a percentage of fund size) made by the fund over its life. Regressions are run only for funds that achieve the waterfall at some point in their lives, and only for fund-quarters beginning four quarters before the waterfall quarter and ending eight quarters after the waterfall quarter (the interval [-4,+8] quarters around the waterfall quarter). Thus, the coefficients on the indicator variables measure the difference between average distributions in each corresponding time period and average distributions in the four quarters prior to the waterfall quarter (the omitted category). The omitted category estimate is the fund fixed effect in specifications in which they are included, and the constant term in specifications that do not include fund fixed effects. These variables are estimated but not reported for brevity. Estimation is OLS for ease in interpreting coefficients. Tobit results accounting for left-censoring at zero are similar. Specifications (1)-(3) include all funds, specifications (4)-(6) include only buyout funds, and specifications (7)-(9) include only venture capital funds. Specifications (3), (6), and (9) include fund fixed effects. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by fund. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable:	Quarterly Distributions (% of Fund Size)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Waterfall Quarter	47.72***	47.73***	47.72***	39.39***	39.40***	39.39***	62.90***	62.91***	62.90***
	(4.60)	(4.60)	(4.81)	(3.73)	(3.73)	(3.91)	(10.96)	(10.97)	(11.45)
1-4 Quarters After Waterfall	3.25***	2.61***	3.11***	1.12	0.54	1.29	7.09***	6.29***	6.43***
	(1.02)	(0.98)	(1.08)	(0.99)	(0.92)	(1.07)	(2.18)	(2.11)	(2.26)
5-8 Quarters After Waterfall	-2.97***	-3.94***	-3.35***	-3.65***	-4.54***	-3.49***	-1.59*	-2.78***	-2.88***
	(0.54)	(0.55)	(0.66)	(0.67)	(0.68)	(0.85)	(0.92)	(0.89)	(1.03)
Total Dists. (% of Fund Size)		0.06***			0.06***			0.06***	
		(0.01)			(0.01)			(0.01)	
Buyout Fund Indicator	-2.93**	0.16							
	(1.38)	(0.62)							
Sample	All	All	All	BO	BO	BO	VC	VC	VC
Fund FE?	No	No	Yes	No	No	Yes	No	No	Yes
Observations	4,106	4,106	4,106	2,617	2,617	2,617	1,489	1,489	1,489
R^2	0.16	0.22	0.26	0.19	0.26	0.30	0.15	0.22	0.24

Table 9: Do Funds with Fees based on Companies Under Management Delay Distributions?

This table presents estimates of whether distributions occur later in life among funds whose management fee basis shifts to net invested capital (cost basis of all investments less cost basis of realized investments) during the fund's life (usually after 4-5 years). It is frequently alleged that such fee structures give GPs an incentive to hold on to "living dead" or "zombie" investments rather than liquidate them and distribute the (modest) proceeds, so that they continue to earn management fees on the capital invested. "Fee Basis Changes" is an indicator variable equal to one if the fund's fee basis changes from committed capital to net invested capital after the investment period (4-5 years of life), and zero otherwise. "ln (Fund Age)" is the natural logarithm of the fund's age in calendar quarters. "Total Dists." is the total distributions to LPs made by the fund over the course of its life (as a percentage of fund size). "PME" is the fund's final PME at the end of its life. "Number Dists." is the total number of calendar quarters in which the fund made a distribution over its life. The unit of observation is a fund-calendar quarter. The dependent variable is a fund's quarterly distribution to LPs, as a percentage of fund size (committed capital). Estimation is OLS for ease in interpreting the coefficients. Tobit estimation yields similar results. Specifications (1)-(3) include all funds, specifications (4)-(6) include only buyout funds, and specifications (7)-(9) include only venture capital funds. Specifications (3), (6), and (9) include fund fixed effects. A constant is estimated in each specification but not reported for brevity. All specifications include vintage year fixed effects. Standard errors (in parentheses) are robust to heteroskedasticity and clustered by fund. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent Variable is Quarterly Distributions (% of Fund Size)									
	All Funds			Buyout Funds			Venture Capital Funds		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Fee Basis Changes ×									
ln(Fund Age)	0.58***	0.48***	0.69***	0.44**	0.31*	0.51**	0.38*	0.32	0.23
	(0.17)	(0.15)	(0.19)	(0.20)	(0.18)	(0.23)	(0.21)	(0.24)	(0.26)
ln(Fund Age)	0.58***	0.53***	0.78***	0.93***	0.90***	1.18***	0.07	0.02	0.21
	(0.09)	(0.08)	(0.10)	(0.10)	(0.10)	(0.11)	(0.15)	(0.14)	(0.16)
Fee Basis Changes	-1.51***	-1.22***		-1.17***	-0.71		-1.15	-0.89	
	(0.41)	(0.41)		(0.45)	(0.47)		(0.72)	(0.68)	
Total Dists. (% of Fund Size)		0.02***			0.02***			0.02***	
		(0.00)			(0.00)			(0.00)	
PME		0.55***			0.48**			0.48	
		(0.18)			(0.22)			(0.30)	
Buyout Fund Indicator	0.07	0.24***							
	(0.25)	(0.08)							
	All specifications include vintage year fixed effects								
Fund FE?	No	No	Yes	No	No	Yes	No	No	Yes
Observations	34,719	34,719	34,719	21,687	21,687	21,687	13,032	13,032	13,032
R^2	0.01	0.03	0.04	0.01	0.03	0.04	0.01	0.04	0.04