Interim Fund Performance and Fundraising in Private Equity

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Abstract

General partners (GPs) in private equity (PE) report the performance of an existing fund while raising capital for a follow-on fund. We document interim performance has large effects of fundraising outcomes; the impact is greatest when backed by exits and for low reputation GPs. Faced with these incentives, GPs time their fundraising to coincide with periods of peak performance through two strategies: "exit and fundraise" and "inflated valuations." Consistent with the former, we find performance peaks are greatest for funds with high realization rates. Consistent with the latter, we find low reputation GPs with low realization rates also experience performance peaks followed by erosions in performance post-fundraising.

Valuations, while always important, take on greater significance during the period of fund marketing. One type of manager misconduct that we've observed involves writing up assets during a fund raising period and then writing them down soon after the fund raising period closes. Because investors and potential investors often question the valuations of active holdings, managers may exaggerate the performance or quality of these holdings. This type of behavior highlights something that I'm sure many of you already know — that interim valuations do, in fact, matter.

Bruce Karpati
Chief, SEC Enforcement Division's Asset Management Unit
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Investors participate in private equity primarily by making capital commitments to new funds that are run for 10 or more years, during which time their capital commitments are tied up in the funds. Typically, a private equity (PE) fund manager will raise a new fund in the third through sixth year of an existing fund's life and the stakes are large, as the PE fund manager's long-term prospects depend critically on successful fundraising and the size of follow-on funds. Given the long-term nature of private equity investments, investors face the difficult task of screening prospective investments based on information they possess about the quality of the PE fund manager including the performance of the manager's current fund. In this setting, the SEC has raised concerns that PE fund managers have incentives to "exaggerate the performance or quality" of the current fund when engaged in fundraising for a follow-on fund.

Extant research shows successful fundraising is of paramount importance to the career goals of PE fund managers. Metrick and Yasuda (2010a) find that successful PE general partners (GPs) are able to increase their per-partner compensation sharply by raising much larger follow-on funds. Chung, Sensoy, Stern and Weisbach (2012) argue that the current fund's performance affects a GP's lifetime income through two channels of roughly equal importance – the carried interest earned on the current fund and the ability to raise a follow-on fund.

However, we know relatively little about how the interim performance of a current fund relates to fundraising for follow-on funds. A fund's interim performance has two components: (1) exited investments to date and (2) the net asset value (NAV) of unrealized investments. GPs are responsible for reporting NAVs to investors in the fund, and these NAVs are generally externally audited. However, it is well known that the

illiquid nature of underlying investments in private companies makes real-time adjustment of NAVs difficult or unrealistic, leading to infrequent price adjustments and stale prices (Gompers and Lerner (1997), Woodward (2009), Metrick and Yasuda (2010b)). For example, NAVs of venture firms are often marked up significantly around the time of subsequent capital injections (Cochrane (2005), Korteweg and Sorensen (2010)).[1] Prospective investors in the follow-on fund must thus evaluate the current fund's interim performance in the presence of significant information asymmetry, particularly with respect to the NAVs reported by the fund.

In this paper, we use fund level cash flow and quarterly NAV data for over 800 US-focused private equity funds (both buyout and venture capital (VC) funds) raised between 1993 and 2009 to address the following questions: Does good interim fund performance (observed at the time of fundraising) materially affect the ability of PE firms to raise a follow-on fund? If so, do PE firms respond to these incentives by timing their fundraising campaigns to coincide with periods when their current fund's interim performance is at its peak? Do PE firms keep their NAV valuations inflated during the fundraising period, and subsequently mark them down once the fundraising is concluded?

A key presumption of the SEC's concerns is that interim performance materially affects the ability of a GP to successfully fundraise. We find strong evidence that this underlying assumption is true. Specifically, the current fund's most recent percentile rank (relative to its vintage-year cohort funds) has a positive and economically significant effect on the GP's probability of successfully raising a follow-on fund and on the size of the fund raised. Among buyout (VC) funds, a GP with an existing fund that ranks among the top quartile of its vintage year cohort is able to raise a follow-on fund at a rate that is 5.7 (4.5) times greater than that of a bottom quartile fund. The economic magnitude of the interim performance effect is much larger than that of other variables that we consider. Moreover, LPs seem to be focused on what GPs have done for them lately, as the impact of having a top quartile current fund on a GP's ability to fundraise is much greater than the impact of having a *prior* top quartile fund.

These empirical results extend those in Chung et al. (2012), as we focus on the impact of the fund's interim rather than final performance which is a crucial distinction given the SEC's concerns about interim reporting. Hochberg, Ljungqvist, and Vissing-

[1] Also see Phalippou and Gottschalg (2009) and Stucke (2011).

Jorgensen (2014) study VC funds and analyze the impact of interim performance on the probability of raising and the size of a follow-on VC fund, though their analysis focuses on the question of whether incumbent LPs possess soft information about GP ability that is *not* revealed in interim performance.

We conjecture that reputation modulates the impact of interim performance on fundraising success. Interim performance will be more important for small, young, and low-reputation GPs, since they have little track record or accumulated reputation capital.[2] To test this conjecture, we split the sample based on the size, age, and reputation (measured based on the performance of past funds) of GPs. For expositional ease we refer to this group of GPs as low status GPs. We document the impact of interim performance on fundraising success is stronger for these low status GPs in both our buyout and VC samples.

We also conjecture that the verifiability of interim performance results matter. Recall that interim performance for a PE fund is a function of exits and reported valuations. Exits (or realizations) represent verifiable transactions that result in cash distributions to LPs, while reported valuations (or NAVs) represent the estimated valuations of unexited companies. For an LP, it is much harder to verify a high valuation of an unexited company than a successful exit. Thus, LPs will have more faith in the veracity of interim performance when it emanates from good exits, and interim performance that is backed by verifiable exits will have a greater impact on the fundraising prospects of GPs.

The impact of realizations on fundraising prospects is arguably more important for low status GPs. These GPs have less reputation capital to lean on when fundraising and must convince prospective LPs of their skill. LPs are generally skeptical of the upstart GPs and are more willing to invest in their follow-on funds when the interim performance of the current fund is backed by realizations. In contrast, for established GPs with accumulated reputation capital, interim performance is likely to be generally less

[2] Gompers and Lerner (1998b) find that older and larger VC GPs raise larger funds. Gompers (1996) finds that young VC GPs take portfolio companies public earlier than older VC GPs in order to establish a reputation and successfully raise capital for new funds. Similarly, Ljungqvist et al. (2007) find that younger buyout GPs invest in riskier buyouts in an effort to establish a track record.

important; successful exits, while helpful, would not turn the dial on fundraising prospects as much for this group compared to upstart GPs.[3]

To test these conjectures, we identify funds that have high rates of realization (or exits) relative to their vintage year cohort and interact a high realization dummy variable with interim performance. For both our VC and buyout sample, we find that the combination of high realizations and a top quartile fund at the time of fundraising greatly improves fundraising prospects for low status GPs. Among GPs with accumulated reputation capital, realizations at the time of fundraising are less important.

Given these incentive results, we hypothesize and find that GPs time their fundraising activities to coincide with periods when the current fund's interim percentile rank is at its peak.[4] We define the conclusion of the fundraising period as the quarter in which we observe the first cash flow activity in the follow-on fund. For buyout fundraisers, the performance of the current fund peaks three quarters prior to the conclusion of fundraising; for VC funds, the peak performance is observed at the conclusion of fundraising. For both buyout and VC funds, we observe a significant improvement in the performance rank of fundraisers prior to the conclusion of fundraising and a subsequent deterioration post-fundraising. Moreover, the performance peaking tends to be greatest for low status GPs.

These timing results are consistent with two noncompeting explanations. GPs might pursue a strategy of exiting a successful investment and fundraising in the wake of an exit, which we refer to as an exit and fundraise strategy. The exit and fundraise strategy, when combined with generally conservative accounting of the valuation of portfolio companies, would generate the peak performance pattern that we document and would not require that GPs inflate NAVs. Alternatively, GPs might inflate valuations in an attempt to overstate the interim performance of the current fund and impress prospective investors (the NAV inflation hypothesis). To test whether one or both of these noncompeting mechanisms are at play, we conduct three tests.

First, we condition our peaking results based on the realization rates of the fund during the fundraising period. The exit and fundraise story predicts peaking only among

[3] See Chung et al. (2012) and Boleslavsky et al. (2015).

[4] Note that our results are not about timing with respect to market performance (the hot market effect discussed by Gompers and Lerner (1998b), Kaplan and Schoars (2005), Robinson and Sensoy (2011) and others) since we are analyzing the performance rank of funds *relative* to their cohort.

funds with high realizations; the NAV inflation hypothesis predicts peaking in both high realization and low realization funds. Consistent with the exit and fundraise story, we find the peaking is most obvious for funds with high realizations rates at the time of fundraising. However, consistent with the NAV inflation hypothesis, we continue to observe performance peaks for low realization funds, but *only* among low status GPs. From this evidence, we conclude that the exit and fundraise story has an important role in explaining the observed performance peaks but cannot explain the performance peaks observed for low status GPs with few realizations.

To investigate whether the erosion in the performance rank is partially attributable to NAV inflation during the fundraising period, we conduct two analyses. First, we examine the size and incidence of NAV markdowns in the post-fundraising period. We define a markdown as a decrease in a fund's reported NAV (after adjusting for calls and distributions). For both the buyout and VC sample, we document that the size and the frequency of NAV markdowns significantly increases in the post-fundraising periods, but this result can be traced to NAV markdowns for low status GPs with low realization rates. These results dovetail with the observation that the low status GPs with low realization also present some evidence of performance peaking and lend further credibility to the notion that some low status GPs inflate valuations at the time of fundraising.

In our second approach, we restrict our analysis to mature funds and analyze the post-fundraising performance of funds. To do so, each time there is a fundraising event for a vintage year cohort, we calculate a pseudo value multiple (PVM) for each vintage year cohort fund assuming an investor buys the fund at its end-of-quarter NAV and holds the fund to liquidation. In this analysis, we document that the PVMs of buyout funds purchased at the time of fundraising are reliably lower than those purchased at other times or those of other funds. Moreover, this result is once again more pronounced for low status GPs and, importantly, is largest for low status GPs with low realization rates at the time of fundraising. Though our point estimates for VC funds are suggestive of performance erosions post-fundraising, they are not statistically significant.

Overall our results indicate that PE firms, particularly small, young, and low-reputation firms, face strong incentives to report good interim performance and are good at timing their fundraising activities to coincide with periods of peak performance. Faced

with these incentives, PE firms engage in an exit and fundraise strategy. However, we also find some evidence that cannot be explained by the exit and fundraise strategy, but is consistent with NAV inflation. Specifically, funds with low realization rates at the time of fundraising also experience performance peaks, but *only* among low status GPs. Further, low status GPs with low realization rates also experience bigger and more frequent markdowns post-fundraising. For buyout funds, we are able to detect reliable erosions in performance during the post-fundraising period. In combination, these results lend credibility to the SEC's concerns regarding the valuation of private equity investments during fundraising periods.

1 Related Literature

Our results complement those in two recent working papers that examine related questions. Brown, Gredil, and Kaplan (2015) use fund-level data provided by Burgiss and find that the current fund's public-market-equivalent[5] (PME)-based cumulative (risk-adjusted) excess returns do not decline around fundraising events for those GPs that successfully raise follow-on funds. In contrast, the cumulative excess returns peak and decline near the end of fund's life for those GPs that are ultimately unable to raise follow-on funds. The authors interpret that latter result as evidence of NAV inflation by unsuccessful desperate GPs. They also find that both the interim performance and the change in performance between fundraising dates and final fund resolution dates positively affect the GP's ability to raise follow-on funds.

Jenkinson et al. (2013) use fund-level data for PE investments made by CalPERS and find that quarterly changes in NAV valuations are positive during fundraising periods, and negative in year 3 to 6 after fundraising events, which is consistent with our observation that the size and frequency of markdowns increase in the post-fundraising period. They also find that quarterly changes in internal rates of returns (IRRs) and value multiples (VMs) are positive in periods shortly before fundraising events, but turn negative by fundraising dates and remain negative for 6 years after fundraising events.

Our analysis differs from these papers in two ways. First, we document that the reputation capital of a GP is an important determinant of their behavior during fundraising events. GPs with significant accumulated reputation capital likely have less

[5] Kaplan and Schoar (2005).

incentive to time their fundraising events to coincide with periods of peak performance and/or inflate the valuations of their current fund. High reputation GPs can point to their prior success when raising capital and may tarnish their reputation by inflating NAVs (if subsequently revealed) during the fundraising period. Since investors have less precise priors about younger less-established PE firms and might update their beliefs more drastically based on the interim performance of the current fund alone (as compared to a long track record of an old, venerable PE firm)[6], temptations to engage in timing and/or NAV management are predicted to be the most severe for low status GPs. This is precisely what we find.

Second, our analysis focuses on the interim performance measured as the fund's percentile rank relative to its vintage year cohort funds. We believe this focus is important given the prevalent industry practice of benchmarking against vintage year cohorts and using "top-quartile" status as evidence of a good track record in marketing.[7] Since the lack of time-weighted returns and sample selection issues make it difficult to estimate the fund manager's alpha using standard asset-pricing models (Metrick and Yasuda (2011)), investors might substitute top-quartile status as de-facto evidence of alpha;[8] if so, then GPs might gain more from maximizing the relative percentile rank vis-à-vis vintage year cohorts at the time of fundraising than from maximizing the absolute return at the end of the fund's life.[9] Finally, the use of performance ranks naturally controls for two important characteristics of private equity performance: (1) there is strong variation in performance over boom and bust market cycles and (2) standard performance measures (e.g., internal rates of return and value multiples) are generally low early in a fund's life and gradually improve (the J-curve).

In a recent working paper, Chakraborty and Ewens (2015) use portfolio company level data for a sample of VC funds and provide evidence that dovetails neatly with our analysis. Specifically, they document that, after fundraising, VC funds write off past

[6] Chung, Sensoy, Stern, and Weisbach (2012).
[7] Evidence of performance persistence in private equity (Kaplan and Schoar (2005), Harris, Jenkinson, Kaplan, and Stucke (2014)) further supports the idea of investing in GPs with top-quartile funds.
[8] This benchmarking practice using quartiles may change in the future if the necessary data to compute PMEs become easily available to prospective investors. As of the writing of this article, however, prospective investors for follow-on funds in general lack access to the cash flow and valuations data to the current fund to compute its PMEs. Also see Korteweg and Nagel (2015) and Sorenson and Jagannathan (2014) for more generalized analysis and extension of the PMEs.
[9] Put another way, it might be more advantageous to fundraise when their relative performance is at its peak even if their absolute performance is below its lifetime maximum, than the other way around.

portfolio company investments more often, while investments done after fundraising have lower returns and a lower probability of successful exit.[10] These results are quite consistent with our observations based on the analysis of NAV markdowns, which tend to be more frequent and of greater size in the post-fundraising periods for both VC and buyout funds.[11]

2 Fundraising in the Private Equity Industry

Typically, private equity (PE) funds are organized as limited partnerships, with private equity firms serving as general partners (GPs) of the funds, and large institutional investors and wealthy individuals providing the bulk of the capital as limited partners (LPs). These funds typically last for ten years, so successful PE firms stay in business by raising a new fund every three to six years. When a PE firm decides to raise a new fund, the GPs of the current fund begins a fundraising campaign that lasts anywhere between a few months to more than a year and a half, depending on the prestige and perceived ability of the PE firm, overall market conditions, and the size and terms of the fund being raised.

Unlike mutual funds, private equity fund performance is reported using internal rates of return (IRRs) and value multiples (VMs).[12] Before the Freedom of Information Act (FOIA) forced large public LPs to disclose returns of individual funds they invested, leading to emergence of third-party data aggregators such as Preqin in recent years, Venture Economics provided summary information about IRRs and VMs for a cohort of same-vintage-year, same-fund-type, same-geographic-region funds while maintaining anonymity of individual funds who provided them with their performance data. In particular, the cutoffs for the median and top-quartile of performance for each vintage year are closely watched statistics and have become the de facto benchmarks for private

[10] In a related paper, Braun and Schmidt (2014) find that returns to investments exited during fundraising are significantly higher than those exited post-fundraising. Crain (2014) finds that conditional on achieving a good performance early in a fund's life and thus securing a follow-on fund, GPs subsequently increase riskiness of their fund portfolios.

[11] Also see Arcot et al. (2014) and Degeorge et al. (2015) for evidence of strategic participation in SBOs (secondary buyouts) by fundraising GPs.

[12] Value multiple, also called investment multiple or Total Value to Paid-in Capital (TVPI), is defined as (Cumulative Distributions to LPs to date + NAV of unrealized investments)/Cumulative Calls to date. A value multiple of one implies that the sum of realized and unrealized investment values equals the amount of dollars that the LP paid into the fund. Fund level performance is typically reported using VMs and IRRs.

equity funds. Because it is very difficult to measure risk for individual funds, the dominant performance measures in the industry are these vintage year comparisons.

2.1 Interim Performance and Fundraising

A key presumption underlying the SEC's concerns regarding the reporting of interim performance is that interim performance matters when a GP is engaged in fundraising. To the extent that GPs compete with other GPs when seeking to raise capital for a new fund, the interim performance of the fundraising GP's current fund relative to those of the same-vintage-year cohort funds is likely an important signal of the GP's ability to prospective investors. Ceteris paribus, the higher the current fund's interim performance relative to its cohort funds, the higher the probability that the GP can successfully raise the next fund.

The effect of interim performance on fundraising depends on the relative importance of interim performance as an information signal. We hypothesize that interim performance of existing funds is particularly important in the fundraising efforts of young GPs that lack a strong reputation among LPs. Young GPs with only a short firm history do not have past track records, and good interim performance is needed to boost the investors' demand for their new fund. Similarly, GPs who have raised relatively little capital in the past or who have never had a top-quartile fund before (the aforementioned key benchmark in the industry) likely lack the strong reputation that would generate investor demand for their new fund. In contrast, old, large, or high-reputation GPs with previous top-quartile funds rely less on the current fund's interim performance to appeal to their prospective investors, and hence we predict their ability to raise funds will be less sensitive to the interim performance of existing funds.

In summary, for the SEC concerns regarding the reporting of interim valuations to have credibility, interim performance must materially affect the ability of GPs to fundraise. To set the stage for our subsequent analysis, we test the following incentive hypothesis:

> H1: Interim performance of a fund affects the ability of a GP to raise a follow-on fund.

To the extent that interim performance matters, we conjecture that these effects are more pronounced for small, young, and low-reputation GPs and when interim performance is

backed by successful exits. In our empirical analysis, we test these hypotheses by analyzing the impact of interim performance on the probability of successfully raising a follow-on fund and the size of the follow-on fund. We further examine whether GP reputation and interim performance backed by exits modulates the impact of interim performance on fundraising.

2.2 The Timing of Fundraising

If the current fund's interim performance positively affects the GPs' probability of successful fundraising, GPs have incentives to time fundraising to coincide with a period of strong *relative* performance for the current fund. This timing would be plausible if the GP possesses private information regarding the performance of portfolio companies held by the fund (Lerner (1994), Gompers and Lerner (1998a)). Hence, we expect the current fund's interim performance rank to peak around the fundraising events. In our empirical tests, we formally test the following timing hypothesis:

> H2: The performance rank of a GP's current fund peaks during the fundraising period for a follow-on fund.

We further hypothesize that the incentive to time fundraising events around periods of peak performance are stronger for small, young, and low-reputation GPs.

2.3 Mechanisms that Generate Peak Performance

2.3.1 Exit and Fundraise

Note that evidence in favor of the timing hypothesis does not necessarily imply that GPs are manipulating reported valuations to influence their performance ranking for two reasons. For example, GPs might follow a simple rule of fundraising following a strong exit. This rule, when combined with the generally conservative accounting for portfolio companies, would yield generally higher performance ranks during fundraising periods. Thus, a decline in the performance rank of a fund in the post-fundraising period might naturally occur if the companies held in the current fund have average performance in the post-fundraising period. For example, a GP might time a fundraising event to coincide with a period when its fund is the top-ranked fund among its vintage year cohort. Subsequent to the fundraising event, this top-ranked fund might perform on par with its peers, but be overtaken in the rankings by other funds with superior performance. Thus, evidence consistent with the timing hypothesis would suggest that GPs are good at

timing their fundraising events to coincide with periods of peak performance, but does not necessarily imply valuations are inflated at the time of the fundraising event.

To test for evidence of the exit and fundraise strategy, we compare the performance ranks of GP's current fund conditional on whether the GP has a high rate of exit. If we observe greater performance peaking among GPs with high realization rates relative to GPs with low realization rates this would be evidence in favor of the exit and fundraise hypothesis. In our empirical tests, we formally test:

> H3: The performance rank of a GP's current fund peaks during the fundraising period for a follow-on fund more when the fund has high realization rates relative to vintage-year cohort funds.

2.3.2 Inflated Valuations

Evidence in favor of the exit and fundraise strategy does not rule out the possibility that GPs inflate valuations at the time of fundraising. GPs can pursue a strategy where they exit and fundraise while inflating the valuations of their remaining portfolio companies. To detect NAV inflation at the time of fundraising, we conduct two analyses. First, we analyze the frequency with which GPs engage in markdowns, which we define as a downward adjustment in the fund's reported NAV (adjusted for calls and distributions) following a fundraising event. If NAVs are inflated at the time of a fundraising event, we expect to observe larger and more frequent markdowns following fundraising events. Second, we analyze the post-fundraising performance of GPs by assuming that an LP invests in the fund at the NAV as of the fundraising quarter. In our empirical analysis, we test the following two hypotheses related to NAV management hypothesis:

> H4: The size and frequency of NAV markdowns increase following fundraising events.
>
> H5: Investments in fundraising GPs' current funds at stated NAVs at the time of fundraising perform poorly.

As in the case for the timing hypothesis, we expect that the low status GPs with few exits in their current fund face the greatest temptation to upwardly bias valuations during the fundraising period for a follow-on fund. Thus, we also examine whether these

effects differ for small, young, and low-reputation GPs vs. other GPs conditional on the realization status of the fund at the time of fundraising.

To summarize, we investigate the following questions in this paper: Does interim performance significantly affect the ability of a GP to raise capital for a follow-on fund (the incentive hypothesis)? Do GPs time the fundraising for a follow-on fund to coincide with periods of peak performance (the timing hypothesis)? Do GPs pursue an exit and fundraise strategy (the exit and fundraise hypothesis) to time fundraising? Is there evidence that GPs inflate valuations when engaging in fundraising for a follow-on fund (the NAV management hypothesis)? For each of these questions, we also consider whether the verifiability of interim performance (i.e., realizations observed at the time of fundraising) and GP status modulates these effects.

To preview our results, we generally find strong support for each of our hypotheses. Interim performance rank has a material impact on the ability to raise a follow-on fund and the size of the follow-on fund. GPs engage in fundraising when the performance rank of its current fund is at a peak. We also find evidence that NAV markdowns are larger and more frequent in the post-fundraising period, while there is reliable evidence of erosions in post-fundraising performance for buyout funds. In general, these effects are most pronounced for low status GPs. Moreover, we separately analyze buyout and VC funds and find generally similar patterns for the two types of funds.

3 Data and Descriptive Statistics

3.1 Data Sources

We construct our fund dataset using two data sources. The first is the Private Equity Cash Flow data by Preqin, which provides full cash flow information (calls, distributions, and quarterly NAVs) for private equity funds, and is the key data that allows us to measure the interim performance of sample funds. All cash flow information and NAVs are scaled by fund size and represent a hypothetical LP capital commitment of $10,000. We use the cash flow data updated as of January 2013. The second is the Performance Analyst Database by Preqin, which provides the net private equity fund performance, performance benchmarks, as well as fund type, vintage year,

and size. We use this database to construct our key fund manager attributes as described below.

While both Preqin databases are global and span multiple fund types, we focus our analysis on the U.S. buyout (BO) and venture capital (VC) funds. This is primarily because our research design requires us to measure relative performance ranking among peer groups that are matched on (i) vintage year, (ii) fund type (BO or VC), and (iii) region (U.S.). By focusing on the U.S. BO and VC markets, we have a sufficient number of funds in each vintage year to estimate interim performance rankings for each sample fund. Outside of the U.S. BO and VC markets, the number of funds available for ranking is generally small. We drop the vintage years before 1993 for our sample of U.S. BO and VC funds because the number of funds per cohort year drops sharply prior to 1993. We also drop the vintage years after 2009 because as of January 2013 it is too early for many of these funds' GPs to consider fundraising for the next fund. Using the above criteria, we obtain a sample of 425 BO funds and 450 VC funds raised between 1993 and 2009.

3.2 Descriptive Statistics

In Table 1, we provide descriptive statistics on VMs, IRRs, and size by vintage year for the 425 BO and 450 VC funds that constitute our sample of funds with periodic cash flow data. The performance measures represent the fund's performance as of the date of the last reported cash flow or net asset value. For BO funds in our cash flow sample (panel A), the mean (median) IRR is 11.1% (10.2%) and the mean (median) VM is 1.47 (1.37). The mean (median) size of BO funds is $1.5 billion ($650 million). We also separately identify mature funds, which we define as either liquidated funds (as coded by Preqin) or funds with at least eight years (32 quarters) of cash flow data. The performance of mature funds is somewhat better than that of all funds. For VC funds in our cash flow sample (panel B), the mean (median) IRR is 7.0% (0.9%) and the mean (median) VM is 1.46 (1.04). Consistent with Metrick and Yasuda (2010a), VC funds tend to be smaller than BO funds with a mean (median) size of $362 million ($250 million). The mean performance of mature VC funds is also better than that of all VC funds, though the median performance is slightly worse.

The general pattern of fund performance over time in our cash flow sample is consistent with prior work. BO funds raised in the late 1990s are relatively weak

performers as are funds raised in the years leading up to the financial crisis (2005-2008). VC funds raised through 1998 tend to perform exceptionally well, while those raised since this period have been relatively weak performers.

To assess whether our sample funds are representative of the universe of private equity funds, we calculate the correlation between our sample funds' median value multiple (VM) and Preqin's benchmark VM by vintage year. The correlation is 92% for BO funds and 94% for VC funds. Since our research design requires us to rank a given fund's interim performance relative to its vintage year cohorts, the high correlation in final performance between our sample funds and Preqin funds is reassuring.[13]

4 Methods

4.1 Test of the Incentive Hypothesis

4.1.1 Hazard Rate Model of PE Fundraising

To examine our first question regarding the effect of interim performance on the probability of fundraising, we use a duration model. As discussed in Section 2, PE firms need to raise new funds every several years in order to stay in business because funds have finite lives. At the same time, the fund partnership agreements signed at the funds' inceptions contractually guarantee a highly predictable stream of payments to GPs in the form of management fees for the duration of the fund, typically 10 years. Thus, GPs have considerable latitude in deciding when to raise their next fund, though it is vital that they do so before the current fund expires and they lose the steady payments of fees. Also, in the early few years of the funds' lives GPs are busy prospecting new investments and deploying the current fund's capital, which they are contractually allowed to do anytime until the end of the investment period, typically 5 years. Once the current fund is nearly or fully deployed, GPs have more time to devote to fundraising campaigns, as managing existing portfolio companies takes less time. Thus, the probability of fundraising at a given point in the life of a current fund is not expected to be constant, but rather will typically start low at the beginning of a fund's life, rise in the middle, and decline toward

[13] Harris, Jenkinson, and Kaplan (2014) report that fund performance in Preqin data is qualitatively similar to that in Burgiss and Cambridge Associates, two other leading data vendors, whereas Thomson Venture Economics data yields downwardly biased performance estimates for buyout funds. Also see Sensoy et al. (2014), which report mean (median) IRR of 14.8% (12.7%) for BO funds and 11.7% (1.3%) for VC funds in their sample of 621 (629) BO (VC) funds raised between 1991-2006.

the end of a fund's life. To control for this temporal variation in the probability of raising a follow-on fund, we use a Cox proportional hazard rate model, which is well suited to handle this feature of our sample data.

We define as a "failure" event for fund *n* managed by GP *i* as the completion of fundraising their next fund *n+1*. GPs are allowed to "fail" anytime during fund *n*'s lifetime up to 10 years. Once fund *n*'s GP "fails" and raises the next fund, it leaves the sample for the remainder of the analysis, much like a patient leaves the sample of a medical study once she dies. We define the fundraising quarter for fund *n* as the quarter in which we first observe cash flow activity in the follow-on fund (generally a first call for the follow-on fund) in the Preqin cash flow data.

We specify the hazard rate for raising a follow-on fund of GP *i* as:

$$h(t|x_i) = h_0(t)\exp\left(x_{it}'\beta_x\right) \quad (1)$$

where x_{it} are fund characteristics (some of which are time-invariant and some are time-dependent), β_x is a parameter vector, and $h_0(t)$ is the baseline hazard function common to all funds in the sample.

Figure 1 reports the Kaplan-Meir survival graphs for the sample funds' fundraising events over fund quarters 1 through 40 (year 1 through 10 of fund lifetime). Panel A presents the graph for buyout funds; Panel B presents the result for VC funds. The graph plots the nonparametric maximum likelihood estimate of *S(t)*, the probability that a fund's GP will not engage in a fundraising event by the end of fund quarter *t*.[14] Number at risk along the *x*-axis shows the number of funds "at risk" of fundraising at a given fund quarter, i.e., the number of funds which have neither failed (engaged in a fundraising event) nor otherwise been censored by that point.

The graphs indicate that most fundraising events for buyout fund GPs occur between year 3 and 8 (quarter 8 and 31), as the curve is fairly flat before quarter 8 and after 32. In contrast, VC fund GPs start fundraising as early as year 2 (quarter 4) and conclude most fundraising events by the end of year 7 (quarter 27). About one third (two

[14] Formally, for *t = 1* to *40*, let n_t be the number of funds "at risk" of fundraising just prior to quarter *t,* and d_t be the number of fundraising events ("failures") during quarter *t*. The Kaplan-Meier estimator for *S(t)* is:

$$\hat{S}(t) = \prod_{i=1}^{t} \frac{n_t - d_t}{n_t}$$

fifths) of BO (VC) fund GPs in our sample have not raised follow-on funds by the end of the current funds' tenth year.[15]

Since the slope of the empirical survival function curve is clearly not constant over time, but is changing over the lifetime of a fund, it is important that our analysis of the hypotheses regarding the effects of the interim performance on fundraising probability controls for this empirical pattern. Note that $h_0(t)$ in the Cox proportional hazard model non-parametrically captures this shape and imposes a common shape to all individual funds in the sample. Further, the model allows the individual funds to vary in their hazard rate parametrically, and this individual variation enters the model multiplicatively through exp $(x_{it}'\beta_x)$.

For the baseline model specification, the key interim performance variables are three dummy variables that take a value of one if a fund's performance rank in quarter *t* is in the top (second/third) quartile among its vintage year cohort funds. To calculate the performance rank used to construct the dummy variables, we proceed as follows: First, using Preqin's cash flow data, we calculate the fund's value multiple each quarter. Second, in each quarter, we rank all *N* funds within a given vintage year cohort from highest (*rank* = 1) to lowest (*rank=N*) by the calculated value multiple. Fund *i*'s interim percentile rank for quarter *t* is:

$$\frac{(rank_{it}-1)}{(N-1)} . \qquad (2)$$

Final rank is a fund's final percentile rank and is based on its final performance relative to cohort funds.

As controls, we include a dummy variable that is equal to one if the GP had a top quartile fund *prior* to the current fund (*Past Top Quartile*), the fund's final performance rank (*Final Rank*), the natural log of the current fund's committed capital ($million, *Ln*

[15] Our research design requires that both the current and follow-on funds are in our cash flow data sample, so that we can observe the fundraising quarter as the quarter in which the first cash flow or NAV is reported for the follow-on fund. While this enables us to observe fundraising events more precisely and in a consistent manner, the drawback of this approach is that sometimes we are missing actual fundraising events. For instance, suppose fund I was raised in 1995, fund II in 2000, and fund III in 2006, but fund II is missing from the Preqin cash flow data and we only observe the cash flow activities of fund I and III. We would then code fund I as never raising a follow-on fund during its first 10 years. To the extent that this adds noise to our coding of fundraising quarters, the missing data biases us *against* finding support for our hypotheses.

Fund Size), and the annual return on the Cambridge Associates PE or VC Index through quarter *t-1* (*Buyout* or *VC Mkt. Ret*).

We examine whether the effect of interim performance on fundraising varies with the reputation of the GP. To test this hypothesis, we estimate a fully interactive model that uses quartile dummy variables resulting in separate coefficient estimates for (i) young, small, and low-reputation GPs and (ii) old, large, or high-reputation GPs. Small, young and low-rep GPs are funds run by BO (VC) GPs (i) whose cumulative capital raised prior to the sample fund is less than $1B ($250M) (small), (ii) who have raised fewer than three funds in the past (young), *and* (iii) who had no top-quartile performing funds that are more than 5 years old as of the inception of the sample fund (low-rep). Large, old or hi-rep GPs are the complements of small, young, and low-rep GPs.

To test whether the verifiability of interim performance affects the relation between interim performance and fundraising outcomes, we construct a dummy variable that takes a value of one in quarter *t* if the fund is a "high realization" fund, which we define as a fund where the value of realizations (scaled by committed capital) of the fund are above the median for all funds in the same vintage-year cohort. We estimate a model that interacts interim performance quartile dummies with the double interaction of GP reputation (small, young, low-rep GPs v. others) and the realization status of the fund at the time of fundraising (high v. low).

In Figure 2, we plot the mean (solid line) and median (dashed line) realization rates for a normalized capital commitment of $10,000 for our buyout (Panel A) and VC sample (Panel B) by fund quarter (horizontal axis). For both buyout and VC funds, median realizations are zero for about 10 quarters (2.5 years) when funds are generally in the early stages of the investment period. When GPs are raising a follow-on fund in this early investment period, any realizations in the GP's current fund would put it in the high realization group. Most funds have some realizations beginning in year 3, which is also when the bulk of follow-on fundraising occurs. The skewness of VC realizations versus buyout realizations are also evident as the median and mean realizations are very similar for buyout, but quite different for VC.

4.1.2 Tobit Regression of Follow-on Fund Size Growth

While the key determinant of a GP's long-term success is the ability to raise a follow-on fund, we are also interested in whether interim performance has a material impact on the size of the follow-on fund that a GP is able to raise, since larger funds also redound to the benefit of the GP. To do so, we estimate a regression where the dependent variable is the percentage growth in the size of the follow-on fund relative to the GP's current fund. For example, a GP with a current fund size of $500 million that raises a follow-on fund with capital commitments of $600 million experiences a 20% growth in fund size. GPs that fail to raise a follow-on fund are assigned a percentage growth of -100%.

The independent variables are similar to those described above, but adapted to accommodate the fund-level nature of the analysis. Specifically, interim performance rank for fundraisers is the performance rank of the fund averaged across the four quarters prior to the fundraising event, and the quartile dummy variables are based on this mean interim performance rank. For non-fundraisers, we use the interim performance rank averaged across quarters 13 to 28 (i.e., years three to seven of a fund's life), and the quartile dummy variables are based on this mean performance rank (i.e., a fund with a mean performance rank less than 0.25 would be a bottom-quartile fund). Similarly, the realization status variable for non-fundraisers is constructed by (i) first averaging across quarters 13 to 28, and (ii) using 0.5 as the threshold (i.e., a fund with a mean high-realization status greater than 0.5 would be a high-realization fund).

As controls, we include a dummy variable that is equal to one if the GP had a top quartile fund *prior* to the current fund (*Past Top Quartile*), the fund's final performance rank (*Final Rank*), the natural log of the current fund's committed capital ($million, *Ln Fund Size*), the number of years between the first cash flow of the current and follow-on fund (*Time since Last Fund*), and the annual return on the Cambridge Associates PE or VC Index through the last fundraising quarter (*Buyout* or *VC Mkt. Ret*).[16] Models are estimated with year fixed effects, where year is defined as the vintage year of the follow-on fund for fundraisers and the sixth year of current fund's life for non-fundraisers.[17] To

[16] For nonfundraisers, time since last fund is set to the 75th percentile of that for fundraisers and the buyout (VC) market return is the average annual return on the index from quarter 13 to 28 of the fund's life.

[17] We are forced to make assumptions regarding the relevant interim performance and year to use for non-fundraisers in this analysis. Our results are qualitatively similar if we measure interim performance over

account for the fact that growth is bounded from below at -100%, we estimate these models using a Tobit specification.

4.2 Event Study Test of Timing Hypothesis

To test the timing hypothesis, we analyze the pattern of funds' interim performance rank around fundraising events. In principle, this is similar to a standard event study common in analyses of stock returns around corporate actions. However, instead of stock returns, we analyze a fund's percentile rank relative to its lifetime average percentile rank around the time of a fundraising event. We define event quarter *t=0* as the quarter in which we observe the first cash flow activity for the follow-on fund in Preqin.

We define the excess rank for fund *i* in quarter *t* as its quarter *t* percentile rank less the mean percentile rank for the fund across all reporting quarters. By construction, the excess rank has a mean of zero across quarters. Excess rank measures the extent to which a fund's rank in quarter t deviates from its lifetime average rank. We calculate the average of this excess rank variable across GPs that successfully fundraise between event quarters *-7* to *+14* where quarter *t=0* is the fundraising quarter. If the current fund's interim performance peaks around the fundraising event, that would predict significantly positive excess ranks around $t = 0$.

The timing hypothesis (hypothesis 2) predicts that the excess rank for fundraising GPs will peak around quarter *t=0*. To address our ancillary prediction that the extent of performance peaking depends on the reputation of the GP, we conduct the excess rank analysis separately for (i) small, young, *and* low-reputation GPs and (ii) large, old, or high-reputation GPs. To determine whether successful exits can partially or completely explain our peaking results (hypothesis 3), we analyze the peaking of the two reputation subsamples conditional on whether the fund was a high or low realization fund at the time of fundraising.

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quarters 9 to 28. Similarly, results are unchanged if we base the non-fundraisers' year on the fourth or fifth year of the fund's life.

4.3 Tests of NAV Management Hypothesis

4.3.1 NAV Markdowns

We first test the NAV management hypothesis by analyzing the size and frequency of markdowns after the fundraising period (hypothesis 4). The NAV management hypothesis maintains that NAVs are held at inflated valuations during the fundraising period for a follow-on fund. If true, we would expect to observe a higher incidence of downward revisions of NAVs, what we refer to as NAV markdowns, following the completion of a fundraising event. NAV markdowns can occur in two ways: (1) a GP may mark down the valuation of portfolio companies, or (2) a GP may exit a portfolio company that was held at valuation greater than the exit value.

We estimate NAV markdowns by assuming calls are booked at cost and distributions are held at market value when they occur. For example, we assume a $100 call will increase the NAV of a fund by $100 and a $100 distribution will decrease the NAV of a fund by $100. Our assumption regarding calls is close to what we observe in practice. Our assumption regarding distributions overstates the booked valuation associated with the average distribution, since portfolio companies are generally held at valuations below their exit values.[18] However, this assumption ensures that when we observe a decline in NAV that exceeds the value of the exited investment, we have indeed observed a markdown in the NAV of the fund. With these assumptions, we define a markdown (*MD*) on a $10,000 LP capital commitment as:

$$MD_{qt} = \min\left(NAV_t - (NAV_{t-1} + C_t - D_t), 0\right) \quad (3)$$

We require a minimum level of markdown (-$50) to ensure that our results are not driven by economically small markdowns by setting $MD_{qt}=0$ when equation (3) results in a markdown between 0 and -50; results are qualitatively similar without the filter on small markdowns. In Table 2, we present descriptive statistics on the NAVs, Calls, Distributions, and markdowns for the VC and buyout samples.

[18] To estimate the average effect of a call and distribution on NAV changes, we regress NAV changes (dependent variable) on distributions and calls (independent variables) with year and fund quarter fixed effects. The coefficients on the distribution and call variables can be interpreted as the average effect of a $1 distribution or call on NAV. For buyout funds, the call and distribution coefficients are 0.98 and 0.76 (respectively); for VC funds, the call and distribution coefficients are 0.92 and 0.44. Thus, for both buyout and VC funds calls are booked close to their value. The values of exited investments tend to be held conservatively, with the conservatism being more pronounced for VC funds.

For buyout funds, the mean reported NAV is approximately $5,500 on a scaled LP capital commitment of $10,000. The average call and distribution is quite small (less than $300) because many quarters have no calls or distributions. We observe calls in 60% of buyout fund quarters and distributions in 46% of fund quarters. For VC funds, the mean reported NAV is approximately $5,400. The mean call and distribution is also less than $300 with VC funds reporting calls in 51% fund quarters and distributions in 25% of fund quarters. As expected, VC distributions are less frequent and more positively skewed than buyout distributions. In Figure 3, we plot the average NAV and the interquartile range of NAVs for our sample funds through quarter 40. There is predictable variation in the average NAV, which peaks around quarter 20 (year 5) and then declines as the fund reaches maturity.

Returning to Table 2, the key dependent variable of interest is the size and incidence of markdowns. For buyout funds, markdowns occur in 29% of fund quarters and the mean markdown is -$166. Conditional on observing a markdown, the interquartile range for markdowns is -$111 to -$656. Markdowns are more common (occurring in 45% of fund quarters) and slightly larger in absolute value (mean -$260) for VC funds, which is expected given the generally skewed payoffs associated with VC funds relative to buyout funds.

For both buyout and VC funds, the absolute size and incidence of markdowns tends to be highest in the aftermath of the internet bubble (2000 to 2002) and at the beginning of the financial crisis (2008). In Figure 4, we present the median markdown (conditional on observing a markdown) and markdown incidence by calendar year for buyout (panel A) and VC (panel B) funds. For buyout funds, the size of markdowns varies across years from about -$100 in 1997 to about -$400 in 1998, 2000 to 2002, and 2008. The incidence of markdowns for buyout funds also peaks in 2000 to 2002 and 2008. There is more variation in the size and incidence of markdowns for VC funds. For VC funds, the size of markdowns varies from about -$100 in 1999 to about -$900 in 2000 – the year of the NASDAQ meltdown – with large markdowns in the 2001 and 2002 period as well. The incidence of markdowns is the highest in 2001, 2002, and 2008 for VC funds. These patterns provide comfort that NAV markdowns are picking up economically meaningful variation in the valuation of PE portfolio companies.

Though there is some variation in the size and incidence of markdowns over a fund's life, this variation is modest relative to that across calendar years. In Figure 5, we present the median markdown (conditional on observing a markdown) and markdown incidence by year in a fund's life. For both buyout and VC funds, markdown size is somewhat smaller in the first three years of a fund's life and reaches a relatively stable level in years four through ten. In contrast to the size of markdowns, we tend to observe a steady decline in the incidence of markdowns over a fund's life (with a somewhat steeper decline for VC funds).

Our key independent variable of interest is a dummy variable (POSTFUND) that takes a value of one in periods after a fundraising event. Specifically, $POSTFUND_{iq}$ is a dummy variable that takes on a value of one in quarters *+1* to *+14*, where quarter *0* is the quarter in which we observe the first call of the follow-on fund.[19] The NAV management hypothesis predicts that inflated valuations during a fundraising period will be unwound post-fundraising as the fund either marks down its portfolio companies or exits the investments at valuations that are below their booked valuations. To formally test this hypothesis, we estimate a Tobit regression where the dependent variable is the size of a markdown in quarter q for fund *i* (MD_{iq}):

$$MD_{iq} = a + bPOSTFUND_{iq} + \mu_i + \mu_q + \varepsilon_{iq} \quad (4)$$

As a further robustness check to ensure our results are not driven by a few large markdowns, we also estimate a conditional logit regression where the dependent variable is a dummy variable that takes a value of one if there is a markdown in quarter *q* for fund *i* (MD_DUM_{iq}).

In both models, we include fixed effects for calendar year and fund quarter (μ_y and μ_q, respectively). The calendar year fixed effect controls for the variation in markdowns across market conditions, and the fund quarter fixed effect controls for the variation in markdowns over a fund's life.[20] The coefficient estimate on the key *POSTFUND* variable is an estimate of whether the size or incidence of markdowns is

[19] Results are qualitatively similar when we define *POSTFUND* = 1 in quarters +1 to +8.

[20] In prior drafts of the paper, we include fund fixed effects and find stronger evidence that the frequency and size of markdowns increase in the post-fundraising period – particularly for small, young, and low reputation GPs. However, these results might be driven by low rates of markdowns in the period leading up to the fundraising event rather than high levels of markdowns in the post-fundraising period. By dropping fund fixed effects, we are comparing the performance of fundraisers to all funds after taking out calendar year and fund quarter fixed effects.

large in the period following fundraising relative to other funds at the same stage of the fund's life (fund quarter fixed effect) and general market conditions (calendar year fixed effect). To test our ancillary prediction that the size and frequency of markdowns in the post-fundraising periods varies with GP reputation, we compare results for (i) small, young, *and* low-reputation GPs and (ii) large, old, or high-reputation GPs. To determine whether successful exits can partially or completely explain our markdown results, we analyze the peaking of the two reputation subsamples conditional on whether the fund was a high or low realization fund at the time of fundraising.

4.3.2 Pseudo Value Multiples (PVM) and Post-Fundraising Performance

The advantage of the markdown analysis outlined in the prior section is that it allows us to use all fund-quarter observations to detect unusual patterns in the evolution of NAVs. We also test the NAV management hypothesis by analyzing the post-fundraising performance of fundraisers relative to an appropriate benchmark (hypothesis 4). To do so, we introduce the concept of a pseudo value multiple (PVM), which is the value multiple that is calculated assuming that a prospective investor (LP) buys a fund at its end-of-quarter NAV in quarter t and holds the fund until liquidation:

$$PVM_{it} = \frac{\sum_{\tau=t+1}^{T} D_{i\tau}}{NAV_{it} + \sum_{\tau=t+1}^{T} C_{i\tau}}, \tag{5}$$

where $D_{i,\tau}$ and $C_{i,\tau}$ are distributions and calls, respectively, for fund i in quarter τ, and T is the fund's liquidation quarter. If the fund does not liquidate, we include the last reported NAV for the fund in the numerator of the PVM calculation, but restrict the analysis to mature funds (i.e., funds with a minimum of 32 quarters of cash flow observations) to ensure that we have a reasonable portrait of the fund's final performance.

To test whether the PVMs of funds that are fundraising at t are reliably less than those of funds that are not actively fundraising, we calculate the PVM for all vintage year cohort funds *each* time there is a fundraising event. For example, for the vintage year 1993, our sample includes 10 buyout funds and 8 of the 10 raise a follow-on fund. The 8 funds that raise a follow-on fund yield 7 fundraising events (two funds have a common fundraising quarter of 1997Q3). Thus, there are 7 fundraising events for the 1993 cohort

and for each of these fundraising events, we calculate the PVM for the ten cohort funds yielding a total of 70 observations (8 PVMs for fundraisers and 62 PVMs for non-fundraisers across the 7 fundraising events). We repeat the calculations for each vintage year (y=1993,2007) for the F_y fundraising events and N_y cohort funds in vintage year y.

Armed with observations for all cohort funds ($i=1,N_y$) for each of the fundraising events ($f=1,F_y$) and all vintage years ($y=1993, 2007$), we estimate the following regression:

$$PVM_{ify} = a + bFUNDRAISER_{ify} + \mu_{fy} + \mu_i + \varepsilon_{ify}, \quad (6)$$

where $FUNDRAISER_{ify}$ is a dummy variable that takes a value of one if fund i is the fundraiser associated with fundraising event f for vintage year y. We include vintage year-and-event fixed effect (μ_{fy}) to take out the mean PVM across funds associated with each fundraising event, and fund fixed effect (μ_i) to take out the average PVM over a fund's life. We winsorize the dependent variable, PVM, at the 5th and 95th percentile to deal with outliers. As an alternative, we estimate regressions where the dependent variable is the percentile rank of a fund's PVM relative to other cohort funds. In both specifications, the coefficient of interest (b) measures whether fundraisers have unusual PVMs relative to cohort funds and the fund's own PVM outside of the fundraising window. To investigate whether GP reputation and the realization status of the fund affect post-fundraising performance, we estimate the coefficient on the key *FUNDRAISER* dummy conditional on GP reputation and conditional on the interaction of GP reputation and the realization status of the fund.

5 Results

5.1 Test of the Incentive Hypothesis

5.1.1 Success in Fundraising

Table 3 reports the estimation results for hazard rate models of fundraising events as a function of interim performance rank. Panel A presents the results for BO funds, Panel B for VC funds. In each panel, column (1) shows results for all funds, columns (2a) and (2b) show results for a single model that interacts GP reputation with key variables using separate baseline hazard rates for the two reputation subsamples, and columns (3a) to (3d) show results for a single model that interacts GP reputation and the fund

realization status with key variables and using separate baseline hazard rate for the two reputation subsamples. Hazard ratios (exponentiated coefficient estimates) are shown in all columns.

In column (1) of Table 3, the hazard ratio for being in the 3rd quartile (relative to being in the bottom quartile) is 2.386 for BO funds, and is statistically significant at 1% level. This implies that a fund in the 3rd quartile has a hazard ratio of 2.386 times that of a fund in the bottom quartile category. Likewise, a fund in the 2nd (top) quartile category has a hazard ratio of 3.660 (5.679) times that of a fund in the bottom quartile category. For VC funds, the effect of being in the 3rd or 2nd quartile is quite similar to BO funds, with hazard ratios of 2.300 and 4.087, respectively. However, being in the top quartile is associated with a hazard ratio of only 4.482, which is only marginally better than being in the 2nd quartile. Thus, for VC funds, there appears to be relatively little difference between being in the 2nd and top quartile brackets, whereas for BO funds there is a more measurable improvement in the hazard ratio. These results are consistent with the incentive hypothesis (Hypothesis 1). Furthermore, the impact of a unit change in the interim performance rank has greater positive impacts on the hazard ratio when the fund's performance is lower than when it is higher. For example, moving from the bottom quartile to the third quartile improves fundraising prospects more than moving from the 3rd to 2nd or 2nd to top quartile.[21]

Do these effects vary by the reputation of the GP? Columns (2a) and (2b) of Table 3 report the subsample estimation results where the model specification is the same as in column (1) but the model is estimated as an interactive model with separate baseline hazard rates and coefficients for (i) small, young and low-rep GPs, and (ii) large, old, *or* hi-rep GPs. By construction, small, young and low-rep GPS do not have a prior past top quartile fund, so this variable only appears for large, old, or hi-rep GPs. The buyout (or VC) market return is not interacted with reputation (though results are qualitatively similar with the interaction). Recall small, young and low-rep GPs are run by GPs who lack past track records and are expected to need the good interim performance of the current fund the most in order to successfully engage in a fundraising event. Thus we

[21] In prior drafts of this paper, we also estimate models where the key performance variables are the interim performance rank of the fund and the rank squared. In these models, the squared term has a negative sign for both buyout and VC funds indicating performance ranks affect the hazard rate at a decreasing rate.

expect their fundraising probability to be more sensitive to the interim performance than that for large, old or hi-rep GPs.

For BO funds, Column (2a) in Panel A of Table 3 indicates that indeed there is a much sharper increase in fundraising probability when a fund run by small, young and low-rep GPs improves its interim performance from the bottom quartile to 3rd, 2nd, or Top quartile. For these GPs having a top quartile fund increases the fundraising hazard ratio by 9.425 times – roughly twice the impact (4.050) we observe for large, old, or hi-rep GPs in Column (2b). The differential impact of interim performance for the two subsamples is also evident in the coefficient estimates on the 2nd and 3rd quartile dummy variables. We are able to reject the null hypothesis that small, young, and low-rep GPs are equally or less responsive to interim fund performance than large, old, or hi-rep GPs at *p=0.07* significance level for both the top and 3rd Quartile funds. For the 2nd quartile funds, the p-values are just shy of conventional levels of statistical significance (*p= 0.12*). These results suggest that small, young and low-rep BO fund GPs have particularly strong incentives to demonstrate either the top or 2nd quartile interim performance in order to succeed in fundraising.

For VC funds, the results are equally interesting with some nuanced differences. It appears that for large, old or hi-rep VC fund GPs, there is virtually no difference in fundraising probability whether their current fund is in the Top or 2nd quartile category (3.347 vs. 3.174), and being in the 3rd quartile category is indistinguishable from being in the bottom quartile (1.374 and insignificant). Thus, beating the median is the main meaningful criteria when it comes to fundraising for established VC GPs. In contrast, the fundraising probability is significantly improved for small, young, and low-rep VC fund GPs when such a fund escapes being in the bottom quartile and continues to improve (though less dramatically) as it further hits the 2nd and top quartile marks. We are able to reject the null hypothesis that small, young, and low-rep GPs are equally or less responsive to interim fund performance than large, old, or hi-rep GPs at *p=0.03* significance level for 3rd Quartile funds. For the top two quartiles, the p-values are just shy of conventional levels of statistical significance (*p=0.14* and *0.19* for the top and 2nd quartiles, respectively). Overall, the results in columns (2a) and (2b) are consistent with our conjecture that low reputation GPs need the strong interim performance most in order to successfully raise their next fund.

While interim performance is clearly important when a GP seeks to raise a follow-on fund, it is natural to wonder if the effect of a current fund's performance is as important as having a strong prior (i.e., liquidated) fund. The results in column (2a) and (2b) allow us to address this question by comparing the hazard ratios associated with the two top quartile dummy variables – that for the current fund v. that for prior funds. Among all buyout funds (column (1), panel A), having a past top quartile fund reliably increases the hazard ratio by 1.729, but this effect is less than 1/3rd of that associated with having a top quartile performance for a current fund. For all VC funds (column (1), panel B), having a top quartile past fund *does not* reliably improve a GP's fundraising prospects, in stark contrast to the strong effect of having a top quartile current fund. The results are qualitatively similar, though less in magnitude, when we focus on large, old, or hi-rep GPs (column (2b)).

Our last model interacts quartile performance dummies with GP reputation and the realization status of the fund at the time of fundraising. The results of this specification are presented in columns (3a) to (3d), where each column presents results of the key interactions between GP reputation dummy and the realization status dummy. For example, column (3a) presents results for small, young, and low-repuation GPs with high realizations, while column (3d) presents results for large, old, or high-reputation GPs with low realizations. Coefficients on control variables are presented across columns (e.g., *Past Top Quartile*, *Final Rank*, *Ln Fund Size*, and *Buyout Mkt. Ret.*) when the coefficient is constrained to be constant across the columns.

Realizations are particularly important for the fundraising success of small, young, and low reputation GPs among the buyout funds. The combination of top quartile performance and high realizations increase the hazard ratio by 12.820 for these low status GPs. This effect is much larger than the hazard ratio of 4.371 observed for low status GPs with top quartile performance that is not backed by realizations (significant at *p=0.005*). This general pattern is also evident in the 2nd quartile of performance though the effect is less dramatic (*p=0.15*). However, the impact of top quartile interim performance of fundraising success does not significantly depend on the realizations status of the fund for high status GPs (see columns (3c) and (3d)).

Subsequently, the modulating effect of realization status on the impact of interim performance is more pronounced for low-status GPs than for high-status GPs among the

buyout funds (two-sided test *p*-value=*0.03*). In contrast, among VC funds, the combination of top quartile performance and high realizations is important for *both* high and low status GPs. The hazard ratio of 7.530 (4.539) is significantly larger than 4.397 (2.301) for low-status (high-status) GPs (one-sided *p*-value=*0.08* and *0.02*, respectively), and the difference between the low- and high-status GPs is insignificant.

5.1.2 Follow-on Fund Size Growth

In Table 4, we provide additional evidence on the importance of interim fund performance by analyzing the growth in follow-on fund size as a function of interim performance. For buyout funds, the coefficient estimates on the top, second, and third quartile dummies are 1.816, 1.229, and 0.751, respectively. These estimates suggest that, for buyout funds, having a current fund in the top, second, or third quartile is associated with a 182%, 123%, and 75% increase in the size of the follow-on fund relative to that of a bottom-quartile fund. For venture funds, being in the top, second, or third quartile increases the size of the follow-on fund by 150%, 124%, and 79%, respectively. It is also interesting to note, as was the case for our hazard rate analysis, that the impact of strong interim performance on fund size is economically more important than having a *prior* top quartile fund. For both buyout and VC funds, the coefficient estimate on the *past* top quartile dummy in not reliably different from zero.

For buyout funds, we see strong evidence of differences in these incentives when GPs are partitioned into small, young, and low-rep GPs versus others. Interim performance is a much more important determinant of follow-on fund size for small, young, and low-rep GPs than others. These effects are economically large. For example, a top quartile buyout fund for a small, young, and low-rep GP increases the size of the follow-on fund by 293%, while for other GPs the increase in the size of the follow-on fund is 98%. Formal tests of significance indicate that the impact of interim performance on fund size is much greater for small, young, and low-rep GPs at conventional significance levels (p=.003, .03, and .005 for the top, 2nd, and 3rd quartile dummies, respectively). In contrast, the impact of interim performance on fund size is not reliably different for the two VC subsamples, perhaps because VC funds do not enjoy the same economies of scale as buyout funds (Metrick and Yasuda (2010a)).

Our final model interacts performance, GP reputation, and realization status in columns (3a) to (3d). These results generally echo those of the prior section. The combination of top quartile performance and high realizations is particularly important for low status GPs, and this result is more pronounced for buyout than VC funds. Among VC funds, the combination of top quartile performance and high realizations is important for *both* high and low status GPs.

Three takeaways emerge from our analysis of interim performance and fundraising outcomes. First, for both buyout and VC funds, we find strong evidence that interim performance affects the probability that a GP is able to raise a follow-on fund. Second, the effect is more pronounced for small, young, and low-rep GPs. Third, small, young, and low-rep GPs substantially improve their fundraising prospects when strong interim performance is backed by realizations. These results are generally consistent with a world in which LPs more strongly update their priors about low status GPs, but are somewhat skeptical of interim performance that is not backed by realizations. However, LPs do reward strong interim performance even when it is based solely or mostly on reported valuations of portfolio companies. We now turn to the question of whether these incentives affect the timing of fundraising events.

5.2 Event Study Test of Timing Hypothesis

Figure 6 plots the mean percentile rank of funds based on value multiples (VMs) in event time, where t=0 is the quarter of a fundraising event. Thus, only funds run by GPs who have successfully raised follow-on funds by the end of the current funds' 10^{th} fund year are included in the calculation. Furthermore, sample funds are split into (i) small, young, and low-rep GPs and (ii) large, old or high-rep GPs. Panel A presents the result for buyout funds; Panel B presents the result for VC funds.

Several observations can be made from the figure. First, fundraisers are above-average performers in their current funds, at least around the time of fundraising. Indeed, with the exception of the small, young and low-rep VC funds whose mean percentile rank dips below 0.50 between quarter +11 and +13, all other groups of fundraisers stay above 0.5 on average at all times between event quarters -7 and +14. Note that by construction 50% of sample funds have percentile rank below 0.5 at any given point, and over the lifetime of a fund close to two thirds (three fifths) of BO (VC) funds succeed in

fundraising; thus, at least for some of these fundraisers, their above-average performance at the time of fundraising is excessively high relative to their usual performance rank.[22]

Second, the percentile rank performance of fundraisers appears to peak either at or shortly before the time of fundraising. For low (high) reputation BO GPs, the peak is at quarter -3 (-1) at 0.65 (0.62). For low (high) reputation VC GPs, the peak is at quarter 0 (0) at 0.60 (0.65). These results indicate that our sample fundraisers "look their best" exactly when doing so would help them the most – namely when they are about to conclude their fundraising campaigns and are soliciting commitments from prospective LPs.

Third, and perhaps most interestingly, small, young and low-rep GPs have the most dramatic improvement in their performance rank during the fundraising period, whereas it is much less dramatic for large, old or hi-rep GPs. This is consistent with the view that low-reputation GPs have the greatest incentive to time their fundraising events around periods of peak performance.

Finally, comparing the BO and VC fund samples, it is also interesting to note that low-reputation BO fund GPs manage to outperform their high-reputation counterparts in the 3 quarters prior to fundraising events, though on average they underperform. In contrast, low-reputation VC fund GPs never catch up on average with the high-reputation competition among their cohorts. Overall, the results shown in Figure 7 are suggestive of performance peaking around fundraising events, especially for low-reputation GPs.

We formally test whether the fundraisers' performance around fundraising events is excessive by conducting *t*-tests of the mean excess percentile ranks by event quarter. Table 5 reports the results (Panel A for BO funds and Panel B for VC funds). As before, the first column shows results for all fund, columns (2a) and (2b) present results for (i) small, young and low-rep GPs and (ii) large, old or high-rep GPs, and columns (3a) to (3d) consider four partitions that interact GP status with realization status.

All-fund results in Panel A indicate that, BO fund GPs who fundraise are significantly above their own average percentile rank for 11 consecutive quarters between quarter -4 and +6. For example, in quarter -3, the average BO fundraiser is ranked on average 6.9% better than its lifetime average percentile ranks ($p<.01$). Moreover, the

[22] We formally test the extent to which the average performance at the time of fundraising is excessive in the next section.

subsample results show that the results are driven primarily by low-reputation BO fund GPs. Low-reputation fund GPs' excess ranks peak at 10.1% in quarter -3, whereas high-reputation fund GPs' excess rank is only 5.3% at its peak in quarter -1. In every event quarter between -4 and +6, low-reputation GPs' excess rank is greater than that of high-reputation GPs.

Results for VC funds shown in Panel B are qualitatively similar. VC fund GPs who fundraise are significantly above their own average percentile rank for 9 consecutive quarters from -3 to +5. Excess rank peaks in event quarter 0 at 6.2% for all VC fundraisers; for low- (high-) reputation fundraisers, the excess rank peaks in event quarter 0 at 8.6% (4.5%). Furthermore, in every event quarter between -3 and +3, low-reputation GPs' excess rank exceeds that of high-reputation GPs.

When we split the sample based on the realization status of the fund at the time of fundraising (last four columns), we find that much, though not all, of the performance peaking that we observe can be traced to the realization status of the funds. In general, GPs with high realization status at the time of fundraising also have big improvements in their performance ranks at the time of fundraising (regardless of GP status). The same general pattern emerges for both buyout and VC funds. This supports the notion that GPs tend to fundraise on the heels of a good exit. Because portfolios companies are generally booked conservatively, a good exit can dramatically improve interim performance, elevate the GP in its ranking among cohort funds, but the good exit is also difficult to replicate leading to a post-fundraising erosion in the performance ranking of the fund.

The "exit and fundraise" story is compelling, but does not appear to be the only mechanism that yields performance peaking around fundraising events. Specifically, for low status GPs with below median realizations (column (3b)) we still observe some performance peaking for both buyout and VC funds. In striking contrast, we do not observe any performance peaking for high status GPs with low realizations. One possible explanation for this performance peaking among low realization funds managed by low status GPs is inflated valuations.

5.3 Tests of the NAV Management Hypothesis

5.3.1 NAV Markdowns

Our prior results indicate interim performance has a material impact on the ability of a GP to raise a follow-on fund and current fund performance peaks during fundraising periods. Exits (or realizations) are an important part of the story for two reasons. First, LPs appear to be skeptical of the interim performance reported by low status GP when the fund has few exits to show. Moreover, the performance peaking that we document is most pronounced for GPs that have high rates of realization prior to the fundraising period, which is consistent with the exit and fundraise story.

However, LPs do respond to interim performance when assessing a follow-on fund even when the current fund has few realizations (see Tables 3 and 4). More importantly, we observe performance peaks for these low realization funds *only* for low status GPs. These results lend credibility to the SEC's concerns that GPs may inflate valuations during fundraising periods, as undetected NAV inflation will, ceteris paribus, improve the ability of a GP to raise a follow-on fund. To determine whether some of the performance peaking that we document in the prior section is a result of NAV inflation, we analyze the size and frequency of NAV markdowns in the post-fundraising period.

We present our main results in Table 6. As before the fund size is scaled to be $10,000 for all sample funds. Consistent with the predictions of the NAV management hypothesis, we observe markdowns are larger in absolute value and more frequent in the post-fundraising period. For example, for buyout funds the average size of a markdown in the post-fundraising period is larger in absolute value (-$69.7, $p<0.10$) while the incidence of markdowns does not increase much (odds ratio of 1.06=$e^{.0614}$). These patterns are stronger for VC funds with a mean markdown of -$125.2 ($p<0.05$) and a larger increase in the frequency of markdowns (odds ratio of 1.13= $e^{.121}$, $p<0.05$).

Consistent with the notion that the incentives to inflate NAVs are greatest for small, young, and low-rep GPs, we tend to observe larger increases in the absolute size and frequency of markdowns for VC funds though we do not observe a similar effect for buyout funds.

In columns (3a) to (3d), we interact the key post-fundraising dummy variable with GP status and the realization status of the fund. Several interesting patterns emerge. First, we do not find that funds with high realization (columns (3a) and (3c)) increase the

incidence or size of markdowns in the post-fundraising period. Thus, GPs who have good exits and fundraise apparently have little need or incentive to delay markdowns in their remaining portfolio companies. In striking contrast, in column (3b) we observe a higher rate and incidence of markdowns for low status GPs with low realizations. This suggests that low status GPs lacking a good exit hold portfolio companies at inflated valuations at the time of fundraising.[23] We do not observe a similar effect for high status GPs in column (3d). The fact that we only observe evidence of significant markdowns for low status GPs with low rates of realizations is consistent with the notion that low status GPs have little reputation capital at stake (and little to lose) by inflating performance during fundraising events. The results dovetail neatly with our observation that performance peaks for low status GPs with low realization rates, but *not* for high status GPs.

It is comforting that we find generally similar patterns across buyout and VC funds, though the results are somewhat stronger for VC than buyout funds. These differences might arise because of the generally less certain valuations of VC funds relative to buyout funds. In many situations, VC funds will hold portfolio companies with little underlying earnings making valuation difficult and relatively subjective. Moreover, many of the portfolio companies fail and are written off at some point during the fund's life. In contrast, buyout funds generally hold portfolio companies with positive earnings that operate in more established product markets, which provide a more verifiable source of information for valuation.

In summary, our results indicate that the size and frequency of NAV markdowns increases in the post-fundraising period. This effect is confined to low status GPs that lack exits during the fundraising period. We also find that these effects are more pronounced for VC funds, which likely have more subjective valuations of portfolio companies allowing GPs more discretion over the reported valuations of portfolio companies.

[23] Note that this does not necessarily imply that GPs are aggressively marking up valuations prior to fundraising and then adjusting them downward post-fundraising; NAV inflation is also possible in scenarios where GPs keep valuations of unsuccessful investments at par and defer their markdowns until after the fundraising event. Unfortunately, without portfolio company data we are unable to explore this issue in more detail.

5.3.2 Post-Fundraising Performance

In the prior section, we document that low status GPs with few realizations at the time of fundraising engage in more markdowns and larger markdowns following fundraising events. In this section, we test whether the magnitudes of the markdowns are sufficient to affect the post-fundraising performance of the fund by analyzing the pseudo value multiple (PVM) of funds. Recall, the PVM is the value multiple that is calculated assuming that a prospective investor (LP) buys a fund at its end-of-quarter NAV in quarter t and holds the fund until liquidation and we calculate PVMs for all cohort funds each time a member of the cohort has a fundraising event. If fund NAVs are inflated relative to the fundamental values of the underlying portfolio companies during fundraising campaigns, then fundraiser PVMs would be lower than normal following a fundraising event.

The results of this analysis are presented in Table 7. Among all buyout funds, the mean PVM of fundraisers is reliably less than non-fundraisers by -5.34 ppts (*t=-1.76*). This effect is particularly pronounced for small, young, and low-rep GPs, where the mean PVM of fundraisers is -11.0 ppts less than non-fundraisers (*t=-2.51*). For VC funds, we find consistently negative coefficient estimates on the key *FUNDRAISER* dummy variable, but they are not reliably negative nor do we find reliable evidence of differences between the two subsamples.

In columns (3a) to (3d), we interact GP status and the realization status of the fund at the time of fundraising. For funds with high realization rates at the time of fundraising (columns (3a) and (3c)), we observe consistently negative coefficient estimates for both buyout and VC funds (albeit with marginal statistical significance). These results can be explained by the exit and fundraise story. However, the results for low realization funds (columns (3b) and (3d)) yield negative coefficients *only* for the low status GPs. Though the result is statistically significant only for the buyout fund sample, we interpret these results as suggestive that low status, low realization GPs inflate valuations at the time of the fundraising event.

To summarize, our analysis of PVMs provides positive evidence of NAV inflation during fundraising periods for buyout funds, particularly low-realization funds run by small, young, and low-rep GPs. In contrast, the evidence is less convincing for VC funds. We emphasize that one reason we fail to find positive evidence of poor post-

fundraising performance for VCs is that our tests, which require that we restrict our analysis to mature funds so that we have a complete portrait of post-fundraising performance, may lack power.

6 Conclusion

We analyze the interim fund performance of private equity funds around the time of fundraising events using fund level cash flow and valuation data for over 800 funds raised between 1993 and 2009. Using the current fund's percentile rank relative to its vintage year cohort funds as the measure of interim performance, we show that GPs with strong interim performance ranks are significantly more likely to raise a follow-on fund and to raise a larger fund. We also find that the current fund's performance rank is at its peak when the GP is concluding fundraising for a follow-on fund. These results are generally stronger for low status GPs and when interim performance is backed by realizations.

We investigate two mechanisms that generate these results and both play an important role in explaining our results. First, GPs appear to fundraise on the heels of good exits. Consistent with the exit and fundraise story, we find performance peaks are greatest for funds with high realization rates at the time of fundraising. Second, low status GPs appear to inflate valuations at the time of fundraising. Consistent with the inflated valuation story, we find evidence of performance peaking even among funds with low realization rates, but *only* for low status GPs. In additional analyses, we document that these low status GPs with low realization rates experience more frequent and larger markdowns post-fundraising. For buyout (but not VC) funds, we also find some evidence of performance erosion post-fundraising among the same group.

Our study contributes to the policy debate by lending credibility to the SEC's concerns that some PE funds' NAVs are inflated during fundraising periods, while also showing that manipulation is mostly confined to GPs with little accumulated reputation capital. GPs with established track records and strong reputations have little need to inflate performance and potentially much reputation capital to lose by manipulating NAVs around fundraising events. However, low status GPs lacking a strong exit have little to lose and much to gain from inflating valuations to secure funding.

We close by noting that our results represent an equilibrium outcome during the last 20 years under a private equity regulatory regime that many have characterized as lax. One goal of studies like our own is to shine a spotlight on the potentially misleading disclosures by investment managers in general and private equity firms in particular. With increased scrutiny by regulators and the investing public on the valuation methods employed by private equity firms and their fundraising events, the potential costs associated with reporting inflated interim performance will no doubt increase and yield a new equilibrium where we hopefully rarely observe inflated performance around fundraising events.

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Table 1: Descriptive Statistics on Private Equity Funds: 1993 to 2009

The sample consists of private equity funds with interim cash flow and valuation data in Preqin's database. Value multiple (VM) and internal rate of return (IRR) are the last observed VM/IRR for each fund. Mature funds are funds that Preqin records as liquidated or funds with a minimum of eight years of cash flow data. Fund size is missing for 6 buyout and 6 VC funds.

		Value Multiple		IRR (%)		Fund Size ($Mil)		
Vintage Year	No. of Funds	Mean	Median	Mean	Median	N	Mean	Median
PANEL A: Buyout Funds								
1993	10	2.57	2.33	27.9	17.5	10	332	280
1994	13	2.01	1.94	24.9	19.0	13	455	312
1995	10	1.56	1.28	10.8	7.3	10	681	268
1996	18	1.38	1.36	7.3	7.5	18	451	394
1997	17	1.33	1.39	5.6	7.4	17	657	357
1998	36	1.34	1.30	3.6	5.1	36	920	425
1999	22	1.44	1.50	6.2	10.1	22	934	491
2000	35	1.83	1.74	15.4	13.5	35	1,487	1,053
2001	17	1.79	1.84	19.3	19.7	17	1,196	650
2002	15	1.58	1.80	14.4	16.6	15	1,016	500
2003	11	1.60	1.49	13.2	11.7	11	1,928	1,163
2004	27	1.68	1.66	14.1	12.6	27	939	450
2005	46	1.38	1.30	8.5	7.2	44	1,497	788
2006	42	1.19	1.20	4.2	6.3	41	3,039	1,000
2007	47	1.27	1.24	10.2	8.6	46	2,603	1,000
2008	38	1.29	1.29	13.7	15.3	38	2,007	653
2009	21	1.20	1.16	15.9	12.3	19	1,707	915
All Funds	425	1.47	1.37	11.1	10.2	419	1,532	650
Mature Funds	219	1.62	1.60	12.0	11.6	219	948	450
Panel B: VC Funds								
1993	7	4.00	3.11	41.4	40.8	7	110	104
1994	9	6.88	3.20	47.6	34.7	8	119	96
1995	14	3.89	2.01	47.3	26.5	14	135	100
1996	15	3.39	1.80	35.7	14.9	15	162	110
1997	18	1.98	1.27	31.4	8.8	17	146	150
1998	26	1.73	1.00	22.9	0.0	26	231	179
1999	36	0.76	0.67	-8.8	-6.7	35	374	275
2000	67	0.89	0.88	-3.5	-2.5	67	472	314
2001	39	1.16	1.10	0.0	1.6	39	480	350
2002	22	0.92	0.86	-2.9	-3.5	22	267	176
2003	16	0.94	0.90	-3.3	-2.7	16	245	250
2004	26	1.32	1.02	1.0	0.4	26	271	174
2005	24	1.15	1.01	0.9	0.3	24	308	295
2006	46	1.05	0.99	0.2	-0.4	46	505	300
2007	42	1.31	1.20	8.7	6.6	41	325	250
2008	30	1.20	1.08	7.8	4.1	30	507	350
2009	13	1.12	1.16	6.6	7.9	11	602	300
All Funds	450	1.46	1.04	7.0	0.9	444	362	250
Mature Funds	278	1.63	1.01	8.8	0.2	275	328	210

Table 2: Descriptive Statistics on Quarterly Net Asset Values, Calls, Distributions, and Markdowns

All net asset values (NAVs), calls, and distributions are scaled to represent a hypothetical LP capital commitment of $10,000. Equivalently, fund size is scaled to be $10,000 for all sample funds. Fund quarter observations are limited to those reported between quarters 5 and 40 (inclusive).

	N	Mean	Std. Dev.	25th Perc.	Median	75th Perc.
Panel A: 393 Buyout Funds						
NAV	8817	5556.01	3091.21	3260.28	5334.26	7524.16
Distributions (D)	8817	291.31	766.62	0	0	196.46
Nonzero D	4029	637.51	1032.25	49.48	252	769.03
Calls (C)	8817	251.7	480.42	0	20.83	301.21
Nonzero C	5327	416.61	559.76	45	200	613.77
Markdown (MD)	8817	-165.75	536.19	-73.2	0	0
Nonzero MD	2532	-577.2	873.98	-656.16	-270.04	-110.55
Panel B: 424 VC Funds						
NAV	10094	5368.52	6259.77	2836.68	4590.82	6555.63
Distributions (D)	10094	250.84	1685.55	0	0	0
Nonzero D	2538	997.63	3249.22	124.24	369.89	920.17
Calls (C)	10094	230.96	354.92	0	0	400
Nonzero C	5116	455.7	382.28	200	400	574.05
Markdown (MD)	10094	-260.35	1247.34	-188.37	0	0
Nonzero MD	4514	-582.19	1814.43	-521.24	-225.45	-100

Table 3: The Impact of Interim Performance Ranking on Ability to Fundraise

This table presents three hazard rate models of fundraising events as a function of interim performance rank, GP reputation, and fund realizations. We estimate a Cox semi-parametric hazard model using quarterly observations of interim performance for private equity funds that report quarterly cash flow data to Preqin. Panel A presents the results for BO funds, Panel B for VC funds. A "failure" event ("fundraising") is defined as the quarter in which either a cash flow activity or a NAV is reported for the first time for the GP's next fund. We allow the failure to occur anytime in the fund's life up to 10 years. The first model is presented in column 1. The second model is presented in columns 2a-2b and interacts interim performance with GP reputation using separate baseline hazard rates for the reputation subsamples (small, young, and low-reputation v. large, old, or high reputation). The third model is presented in columns 3a-3d and considers the triple interaction of interim performance/GP reputation/fund realization. The interim performance rank variable is the percentile rank of a fund's VM (value multiple) among its vintage-year cohorts in quarter t-1. A top (second/third) quartile dummy variable takes a value of one if the quarter t-1 performance rank is in the top (second/third) quartile among its vintage-year cohort. Past top quartile is a dummy variable that is equal to one if the GP had a top quartile fund prior to the current fund. Final rank is a fund's final percentile rank. Ln Fund Size is the natural log of fund size ($mil). Buyout (VC) Mkt. Ret. is the annual return on the Cambridge Associated buyout (VC) fund index as of quarter t-1. Small, young and low-rep GPs are funds run by BO (VC) GPs (i) whose cumulative capital raised prior to the sample fund is less than $1B ($250M) (small), (ii) who have raised fewer than three funds in the past (young), *and* (iii) who had no top-quartile performing funds that are more than 5 years old as of the inception of the sample fund (low-rep). Large, old or hi-rep GPs are the complements of small, young, and low-rep GPs. A high realization dummy takes a value of one if the cumulative realizations of the fund are above the median for its vintage year cohort in quarter t-1. Hazard ratios are shown with t-statistics in parentheses. A high realization dummy takes a value of one if the cumulative realizations of the fund are above the median for its vintage year cohort in quarter t-1.

Table 3, cont'd

Model:	(1)	(2a)	(2b)	(3a)	(3b)	(3c)	(3d)
GPs:	All Funds	Small, Young, and Low-Rep	Large, Old, or Hi-Rep GPs	Small, Young, and Low-Rep	Small, Young, and Low-Rep	Large, Old, or Hi-Rep GPs	Large, Old, or Hi-Rep GPs
Realizations:	n.a.	n.a.	n.a.	Hi Realization	Lo Realization	Hi Realization	Lo Realization
Panel A: Buyout Funds							
Top Quartile	5.679***	9.425***	4.050***	12.82***	4.371***	3.955***	4.362***
	(6.27)	(5.33)	(3.81)	(5.93)	(2.71)	(3.60)	(3.30)
2nd Quartile	3.660***	5.316***	2.814***	6.379***	4.075***	2.911***	2.713***
	(4.95)	(3.97)	(2.99)	(4.16)	(2.73)	(2.79)	(2.58)
3rd Quartile	2.386***	3.747***	1.649	2.487	4.443***	1.757	1.584
	(3.21)	(3.15)	(1.35)	(1.59)	(3.39)	(1.22)	(1.11)
Past Top Quartile	1.729***	-----	1.950***	-----		1.941***	
	(3.71)	-----	(3.18)	-----		(3.16)	
Final Rank	0.948	0.841	0.953	0.797		0.955	
	(-0.19)	(-0.45)	(-0.13)	(-0.57)		(-0.12)	
Ln Fund Size	1.033	1.249*	1.005	1.189		1.005	
	(0.52)	(1.79)	(0.06)	(1.40)		(0.06)	
Buyout Mkt. Ret.	12.09***	12.13***			11.29***		
	(4.66)	(5.09)			(4.93)		
N Fund-Quarters	7768	7768			7768		
N Funds	419	419			419		
N Fundraisers	204	204			204		
Panel B: VC Funds							
Top Quartile	4.482***	5.964***	3.347***	7.530***	4.397***	4.539***	2.301**
	(5.32)	(4.35)	(3.37)	(4.63)	(3.14)	(3.95)	(2.00)
2nd Quartile	4.087***	5.086***	3.174***	5.532***	4.638***	4.339***	2.612**
	(5.20)	(4.03)	(3.33)	(3.78)	(3.40)	(3.84)	(2.52)
3rd Quartile	2.300***	3.814***	1.374	3.684***	3.855***	1.806	1.250
	(2.91)	(3.29)	(0.82)	(2.61)	(3.09)	(1.15)	(0.53)
Past Top Quartile	0.974	-----	1.001	-----		1.004	
	(-0.15)	-----	(0.01)	-----		(0.02)	
Final Rank	1.525	1.261	1.599	1.267		1.372	
	(1.55)	(0.59)	(1.23)	(0.60)		(0.82)	
Ln Fund Size	1.167*	1.275*	1.146	1.270*		1.107	
	(1.96)	(1.70)	(1.18)	(1.68)		(0.89)	
VC Mkt. Ret.	2.305***	2.250***			2.169***		
	(10.81)	(9.79)			(9.20)		
N Fund-Quarters	8148	8148			8148		
N Funds	442	442			442		
N Fundraisers	205	205			205		

* p < 0.10, ** p < 0.05, *** p < 0.01.

Table 4: Interim Performance Rank and the Size of Follow-on Funds

The table presents results of three Tobit regressions where the dependent variable is the percentage growth in the size of the follow-on fund relative to the current fund. Panel A presents the results for BO funds, Panel B for VC funds. The first model is presented in column 1. The second model is presented in columns 2a-2b and interacts interim performance with GP reputation using separate baseline hazard rates for the reputation subsamples (small, young, and low-reputation v. large, old, or high reputation). The third model is presented in columns 3a-3d and considers the triple interaction of interim performance/GP reputation/fund realization. For fundraisers, the interim performance rank variable is the percentile rank of a fund's VM (value multiple) among its vintage-year cohorts averaged across the four quarters prior to the fundraising event. For non-fundraisers, interim performance rank is the average percentile rank of the fund from quarter 13 to 28 of a fund's life. Past top quartile is a dummy variable that is equal to one if the GP had a top quartile fund prior to the current fund. Final rank is a fund's final percentile rank. For fundraisers, time since last fund is the number of years between the prior fund and follow-on fund's first cash flow; for nonfundraisers, time since last fund is set to the 75th percentile of that for fundraisers. For fundraisers, Buyout (VC) Mkt. Ret. is the annual return on the Cambridge Associated buyout (VC) fund index as of the quarter prior to fundraising; for nonfundraisers, it is the average annual return on the index from quarter 13 to 28 of a fund's life. Models are estimated with a constant term and year fixed effects (FE), where year is defined as the vintage year of the follow-on fund for fundraisers and the sixth year of current fund's life for non-fundraisers. Small, young and low-rep GPs are funds run by BO (VC) GPs (i) whose cumulative capital raised prior to the sample fund is less than $1B ($250M) (small), (ii) who have raised fewer than three funds in the past (young), *and* (iii) who had no top-quartile performing funds that are more than 5 years old as of the inception of the sample fund (low-rep). Large, old or hi-rep GPs are the complements of small, young, and low-rep GPs. *t*-statistics are presented in parentheses. For fundraisers, high realization dummy takes a value of one if the cumulative realizations of the fund are above the median for its vintage year cohort in quarter t-1. For nonfundraisers, high realization dummy equals one if the average high realization status from quarter 13 to 28 of a fund's life is above 0.5, and 0 otherwise.

Table 4, cont'd

Model:	(1)	(2a)	(2b)	(3a)	(3b)	(3c)	(3d)
GPs:	All Funds	Small, Young, and Low-Rep	Large, Old, or Hi-Rep GPs	Small, Young, and Low-Rep	Small, Young, and Low-Rep	Large, Old, or Hi-Rep GPs	Large, Old, or Hi-Rep GPs
Realizations:	n.a.	n.a.	n.a.	Hi Realization	Lo Realization	Hi Realization	Lo Realization
Panel A: Buyout Funds							
Top Quartile	1.816***	2.927***	0.982**	3.302***	1.198	1.086**	0.474
	(4.66)	(5.47)	(2.12)	(6.10)	(1.53)	(2.29)	(0.71)
2nd Quartile	1.229***	1.860***	0.675	2.025***	1.552***	0.396	0.914*
	(3.49)	(4.08)	(1.59)	(3.99)	(2.91)	(0.80)	(1.95)
3rd Quartile	0.751**	1.540***	-0.0216	1.032*	1.753***	0.113	-0.0888
	(2.10)	(3.49)	(-0.05)	(1.79)	(3.66)	(0.18)	(-0.18)
Past Top Quartile	0.332	-----	0.772***	-----		0.729**	
	(1.46)		(2.65)			(2.53)	
Final Rank	0.345	-0.449	0.798	-0.449		0.794	
	(0.86)	(-0.81)	(1.53)	(-0.81)		(1.55)	
Time since Last Fund	-0.323***	-0.333***			-0.329***		
	(-4.10)	(-4.32)			(-4.34)		
Buyout Mkt. Ret.	3.779***	3.643***			3.626***		
	(4.92)	(4.86)			(4.92)		
N Funds	384	384			384		
Panel B: VC Funds							
Top Quartile	1.500***	1.510***	1.513***	1.681***	1.175**	1.693***	1.042**
	(4.87)	(3.50)	(3.88)	(3.56)	(2.16)	(4.17)	(2.04)
2nd Quartile	1.242***	1.131***	1.335***	0.890**	1.400***	1.504***	1.214***
	(4.39)	(3.09)	(3.76)	(2.14)	(3.15)	(3.52)	(3.16)
3rd Quartile	0.791***	0.801**	0.790**	0.842*	0.754*	0.701	0.838**
	(2.81)	(2.18)	(2.28)	(1.70)	(1.86)	(1.48)	(2.25)
Past Top Quartile	-0.120	-----	-0.133	-----		-0.113	
	(-0.63)		(-0.60)			(-0.51)	
Final Rank	0.456	0.491	0.409	0.488		0.348	
	(1.40)	(1.07)	(0.96)	(1.06)		(0.82)	
Time since Last Fund	-0.326***	-0.326***			-0.335***		
	(-4.91)	(-4.87)			(-4.95)		
VC Mkt. Ret.	0.620***	0.617***			0.603***		
	(4.72)	(4.69)			(4.61)		
N Funds	409	409			409		

* p < 0.10, ** p < 0.05, *** p < 0.01.

Table 5: Excess Rank Performance around Fundraising Events

This table presents the mean excess percentile ranks by event quarter, where t=0 is the quarter of a fundraising event. Panel A presents the results for BO funds, Panel B for VC funds. A fundraising event is the quarter when either a cash flow or NAV is reported for the first time for the GP's next fund. We allow the fundraising event to occur anytime in the fund's life up to 10 years. Quarterly percentile rank for a fund-quarter is defined as the percentile rank of fund's VM (value multiple) among its vintage-year cohorts. Excess rank for a fund in quarter t is calculated as the quarter t percentile rank less the mean percentile rank for the fund across all reporting quarters (and is by construction zero when summed across quarters). Excess rank measures the extent to which a fund's rank in quarter t deviates from its mean rank. Small, young and low-rep GPs are funds run by BO (VC) GPs (i) whose cumulative capital raised prior to the sample fund is less than $1B ($250M) (small), (ii) who have raised fewer than three funds in the past (young), *and* (iii) who had no top-quartile performing funds that are more than 5 years old as of the inception of the sample fund (low-rep). Large, old or hi-rep GPs are the complements of small, young, and low-rep GPs. A high (low) realization fundraiser is a fund that is above (at or below) the median for its vintage year cohort in the quarter prior to the fundraising quarter.

Table 5, cont'd

Model:	(1)	(2a)	(2b)	(3a)	(3b)	(3c)	(3d)
GPs:	All Funds	Small, Young, and Low-Rep	Large, Old, or Hi-Rep GPs	Small, Young, and Low-Rep	Small, Young, and Low-Rep	Large, Old, or Hi-Rep GPs	Large, Old, or Hi-Rep GPs
Realizations:	n.a.	n.a.	n.a.	Hi Realization	Lo Realization	Hi Realization	Lo Realization
Event quarter				**Panel A: Buyout Funds**			
-7	-1.7%	-3.6%	0.0%	-4.0%	-2.90%	1.86%	-2.86%
-6	1.0%	-2.6%	4.1%**	-1.0%	-4.89%	9.14%***	-1.97%
-5	1.0%	0.7%	1.3%	1.6%	-0.81%	6.55%***	-5.01%
-4	4.6%***	4.7%**	4.5%**	8.4%***	-1.21%	9.64%***	-1.75%
-3	6.9%***	10.1%***	4.1%**	11.5%***	7.82%**	11.34%***	-4.55%
-2	5.9%***	7.6%***	4.4%**	10.0%***	3.67%	7.63%***	0.56%
-1	6.8%***	8.6%***	5.3%***	10.1%***	6.22%*	8.63%***	1.27%
0	4.7%***	5.3%***	4.2%***	6.7%***	2.81%	6.58%***	1.43%
1	3.8%***	5.2%***	2.8%*	6.2%***	3.39%	3.30%*	2.18%
2	2.9%**	4.7%***	1.3%	7.0%***	0.77%	1.68%	0.66%
3	3.4%***	5.3%***	1.6%	6.5%***	3.34%	2.55%	-0.15%
4	4.2%***	6.0%***	2.6%*	8.9%***	1.37%	3.84%*	0.79%
5	2.8%***	4.8%***	1.1%	6.8%***	1.58%	2.57%	-1.27%
6	1.7%*	3.6%**	0.0%	6.7%***	-1.33%	-0.57%	0.47%
7	1.0%	2.6%*	-0.4%	5.6%***	-2.01%	-0.91%	0.29%
Event quarter				**Panel B: VC Funds**			
-7	-2.0%	-1.3%	-2.5%	2.69%	-5.77%	-2.82%	-2.06%
-6	-0.4%	2.4%	-2.5%	10.28%*	-5.07%	-0.60%	-4.78%
-5	1.2%	2.3%	0.3%	4.95%	-0.79%	4.14%*	-4.49%
-4	1.5%	0.1%	2.5%	4.36%	-2.25%	7.48%***	-3.29%
-3	2.9%*	5.1%*	1.4%	7.85%*	2.64%	10.01%***	-7.75%
-2	4.6%***	7.4%***	2.5%	11.23%***	3.87%	8.47%***	-3.79%
-1	5.5%***	6.9%***	4.5%**	11.27%***	3.17%	9.06%***	-0.44%
0	6.2%***	8.6%***	4.5%***	10.56%***	6.93%**	8.16%***	0.51%
1	4.3%***	5.6%**	3.3%**	5.30%*	6.20%**	5.52%***	0.99%
2	5.2%***	6.5%***	4.3%***	5.52%*	6.74%**	6.14%***	2.29%
3	3.3%***	3.8%**	2.9%**	3.38%	3.60%	5.59%***	0.10%
4	2.7%**	2.0%	3.2%**	2.96%	0.49%	5.15%***	1.14%
5	2.7%**	1.8%	3.3%**	3.29%	-0.36%	4.07%**	2.57%
6	1.0%	-0.2%	1.9%	-0.03%	-1.33%	3.59%**	0.25%
7	0.9%	0.0%	1.5%	-0.86%	-0.51%	3.48%**	-0.49%

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: The Size and Frequency of Markdowns in the Post-Fundraising Period

The table presents estimates of Tobit regressions of markdown size (panel A for buyout, panel C for VC) and logit regressions of markdown incidence (panel B for buyout, panel D for VC). Fund size (committed capital) is scaled to be $10,000 for all sample funds. POSTFUND is a dummy variable that takes a value of one for quarters +1 to +14, where quarter 0 is the quarter in which we observe the first call of the follow-on fund. All regression estimates are based on models with calendar year and fund quarter fixed effects (FE). *t*-statistics are presented in parentheses. A high (low) realization fundraiser is a fund that is above (at or below) the median for its vintage year cohort in quarter t-1.

Model:	(1)	(2a)	(2b)	(3a)	(3b)	(3c)	(3d)
GPs:	All Funds	Small, Young, and Low-Rep	Large, Old, or Hi-Rep GPs	Small, Young, and Low-Rep	Small, Young, and Low-Rep	Large, Old, or Hi-Rep GPs	Large, Old, or Hi-Rep GPs
Realizations:	n.a.	n.a.	n.a.	Hi Realization	Lo Realization	Hi Realization	Lo Realization
Panel A: Tobit Regression, Buyout Funds							
Post-Fundraising	-69.74*	-57.41	-77.74	27.72	-158.9**	-62.83	-90.55
	(-1.72)	(-1.00)	(-1.33)	(0.39)	(-2.11)	(-0.85)	(-1.29)
N Fund-Quarters	8817	8817			8817		
Panel B: Logit Regression, Buyout Funds							
Post-Fundraising	0.0614	0.0756	0.0161	-0.0316	0.206*	0.0380	-0.00235
	(0.98)	(0.85)	(0.17)	(-0.29)	(1.76)	(0.32)	(-0.02)
N Fund-Quarters	8817	8817			8817		
Panel C: Tobit Regression, VC Funds							
Post-Fundraising	-125.2**	-305.7***	65.53	-112.3	-383.2***	142.6	11.90
	(-2.23)	(-3.74)	(0.84)	(-0.85)	(-4.18)	(1.34)	(0.13)
N Fund-Quarters	10094	10094			10094		
Panel B: Logit Regression, VC Funds							
Post-Fundraising	0.121**	0.268***	-0.00849	0.184	0.303***	-0.175*	0.118
	(2.25)	(3.40)	(-0.11)	(1.46)	(3.41)	(-1.72)	(1.30)
N Fund-Quarters	10094	10094			10094		

* p < 0.10, ** p < 0.05, *** p < 0.01.

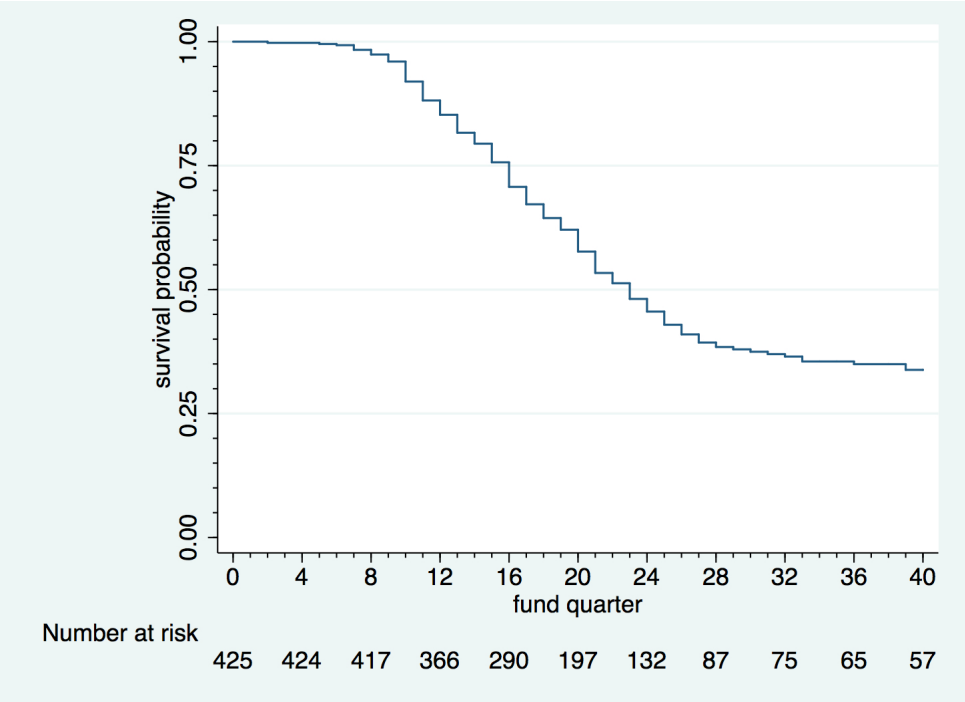
Table 7: Post-Fundraising Performance based on Pseudo Value Multiple

Each time there is a fundraising event among vintage year cohort funds, we calculate a pseudo value multiple (PVM) for each of the vintage year cohort funds assuming an investor purchased the fund at the stated NAV in the fundraising event quarter and held the fund to liquidation (or the last quarter in which we observe an NAV but at least fund quarter 32). Fundraiser is a dummy variable that takes a value of one if the fund's GP completes fundraising for a follow-on fund in the event quarter 0. We exclude neighborhood fundraisers, defined as those fundraising in event quarters -4 to +4. The subsample results in the columns 2-3 are estimated as interactive models with separate Fundraiser coefficients for the two subsamples (small, young, and low-rep GPs and large, old or hi-rep GPs). The results in the columns 4-7 are analogously estimated as interactive models with separate coefficients for the four subsamples (based on both the high-/low-status of the GPs and the realization status). All models include fund and event-vintage year fixed effects. *t*-statistics are presented in parentheses.

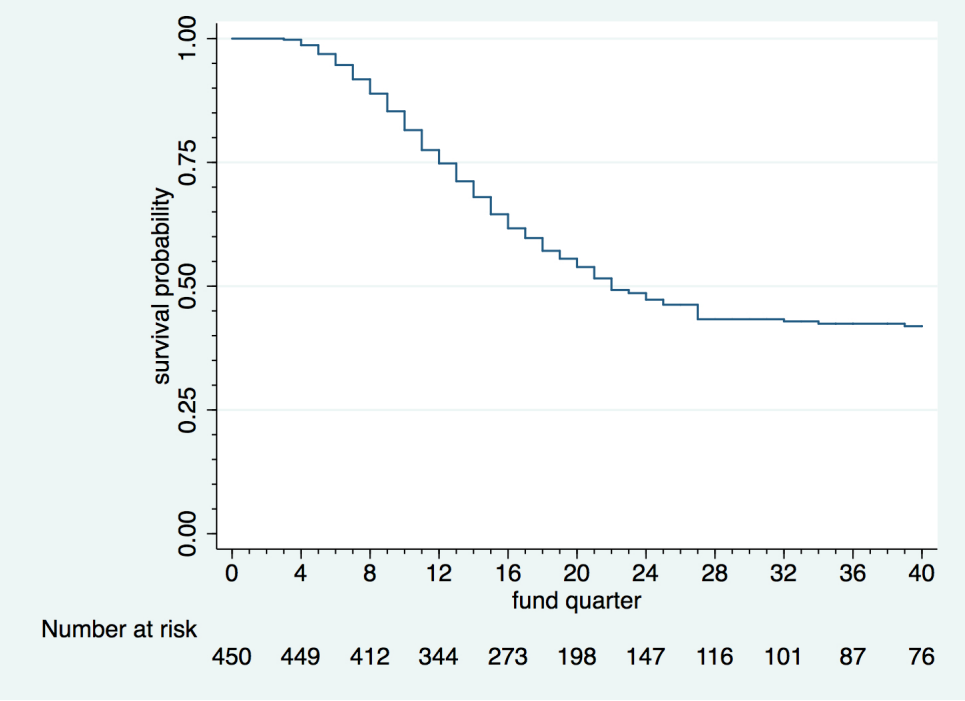
Model:	(1)	(2a)	(2b)	(3a)	(3b)	(3c)	(3d)
GPs:	All Funds	Small, Young, and Low-Rep	Large, Old, or Hi-Rep GPs	Small, Young, and Low-Rep	Small, Young, and Low-Rep	Large, Old, or Hi-Rep GPs	Large, Old, or Hi-Rep GPs
Realizations:	n.a.	n.a.	n.a.	Hi Realization	Lo Realization	Hi Realization	Lo Realization
Panel A: Buyout Funds							
Fundraiser	-0.0534*	-0.110**	0.00138	-0.0976*	-0.125*	-0.0428	0.0370
	(-1.76)	(-2.51)	(0.03)	(-1.65)	(-1.87)	(-0.66)	(0.63)
N Fundraising Events X Cohort Funds	1193	1193			1193		
Panel B: VC Funds							
Fundraiser	-0.0238	-0.0379	-0.0137	-0.0692	-0.0218	-0.0775*	0.0337
	(-1.03)	(-1.08)	(-0.46)	(-1.08)	(-0.52)	(-1.71)	(0.87)
N Fundraising Events X Cohort Funds	1934	1934			1934		

* p < 0.10, ** p < 0.05, *** p < 0.01.

Figure 1: **Kaplan-Meier Survival Graph for Private Equity Fundraising Events**
This graph shows the probability that a fund does not engage in a fundraising event by quarter.

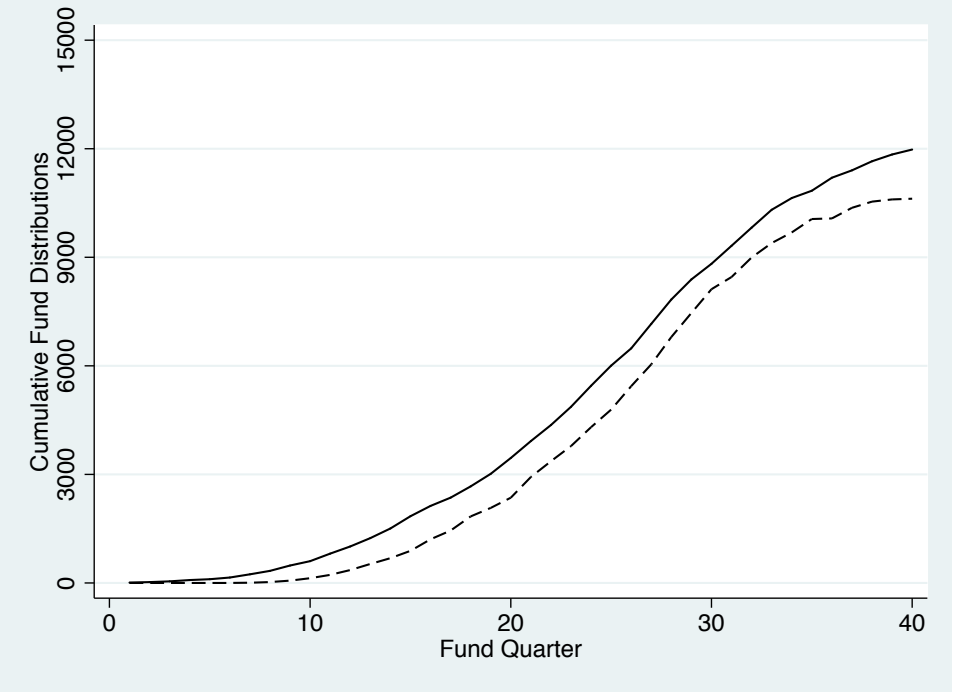


Panel A: Buyout Funds

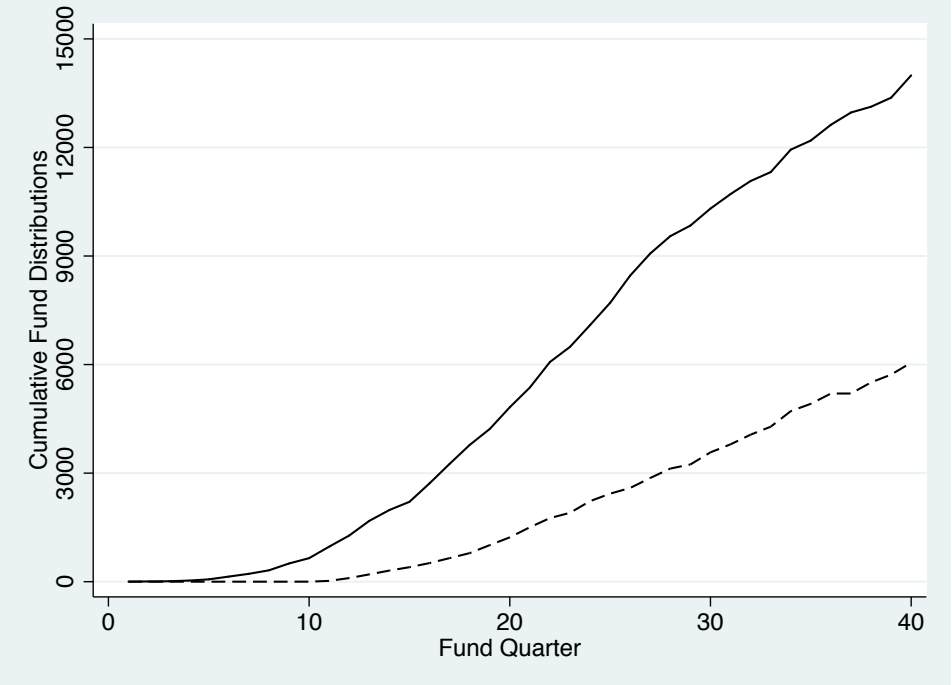


Panel B: VC Funds

Figure 2: **Mean and Median Realizations by Fund Quarter**
This graph shows the mean (solid line) and median (dashed line) cumulative realizations (or distributions) by fund quarter.



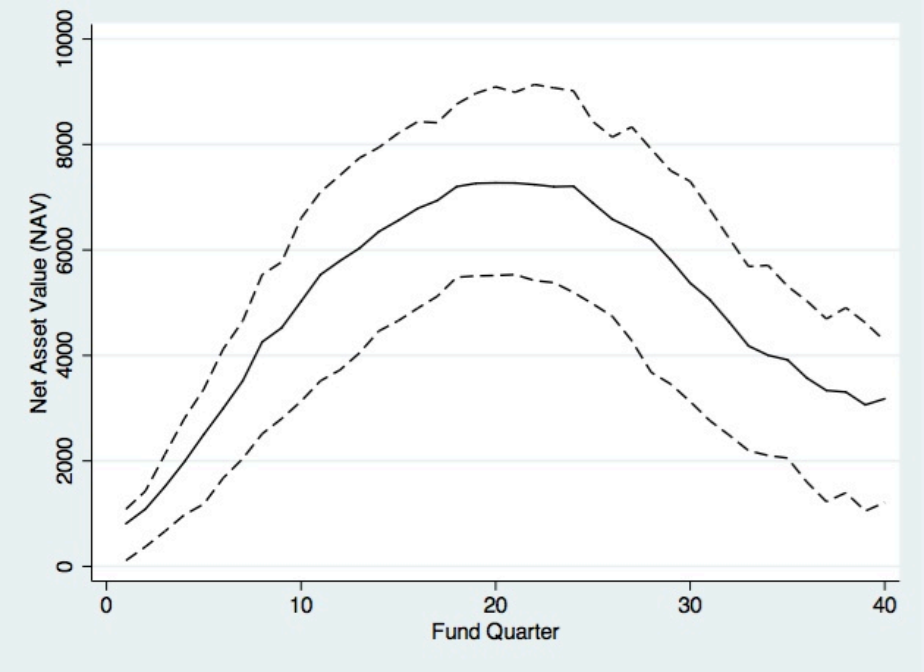
Panel A: Buyout Funds



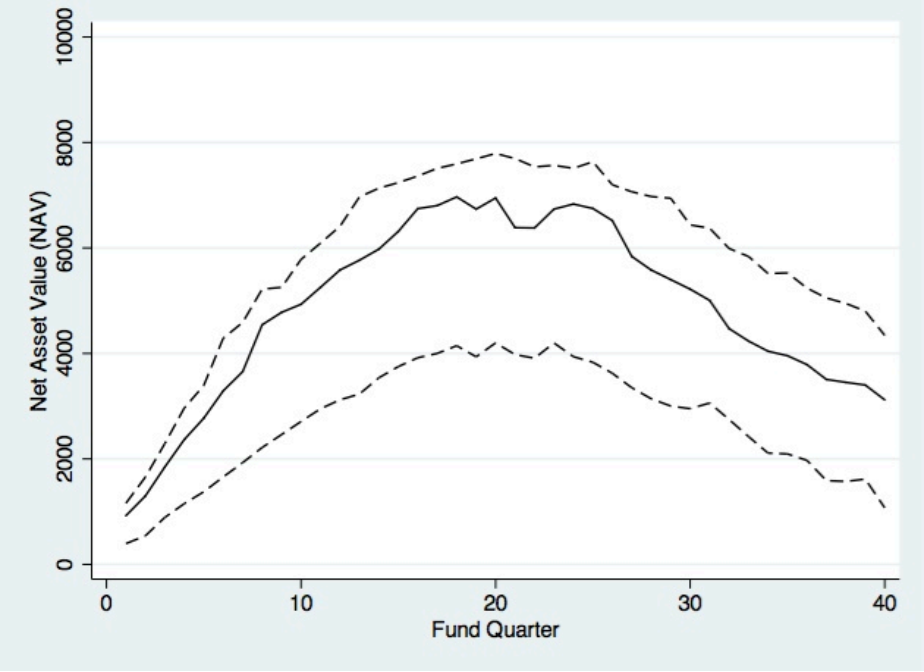
Panel B: VC Funds

Figure 3: Net Asset Value (NAV) by Fund Quarter

The figure presents the mean (solid line) and 25th and 75th percentiles (dashed lines) of NAVs by fund quarter. Fund size (committed capital) is scaled to be $10,000 for all sample funds.

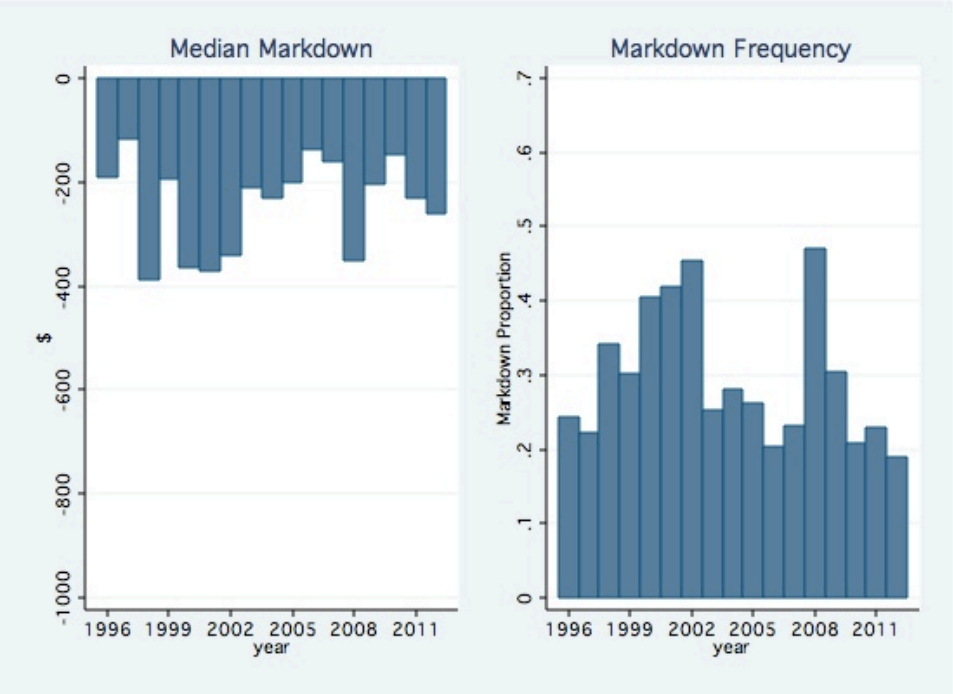


Panel A: Buyout Funds

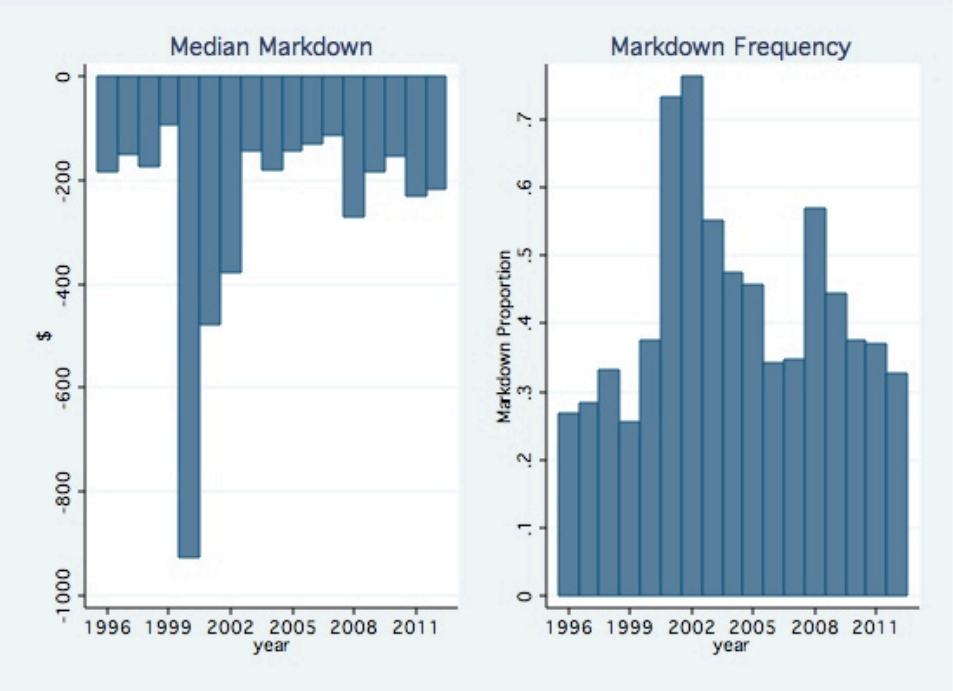


Panel B: VC Funds

Figure 4: Size and Incidence of NAV Markdowns by Year
The figure presents the median size of nonzero markdowns (left graph) and incidence of markdowns (right graph) by year. Fund size (committed capital) is scaled to be $10,000 for all sample funds.



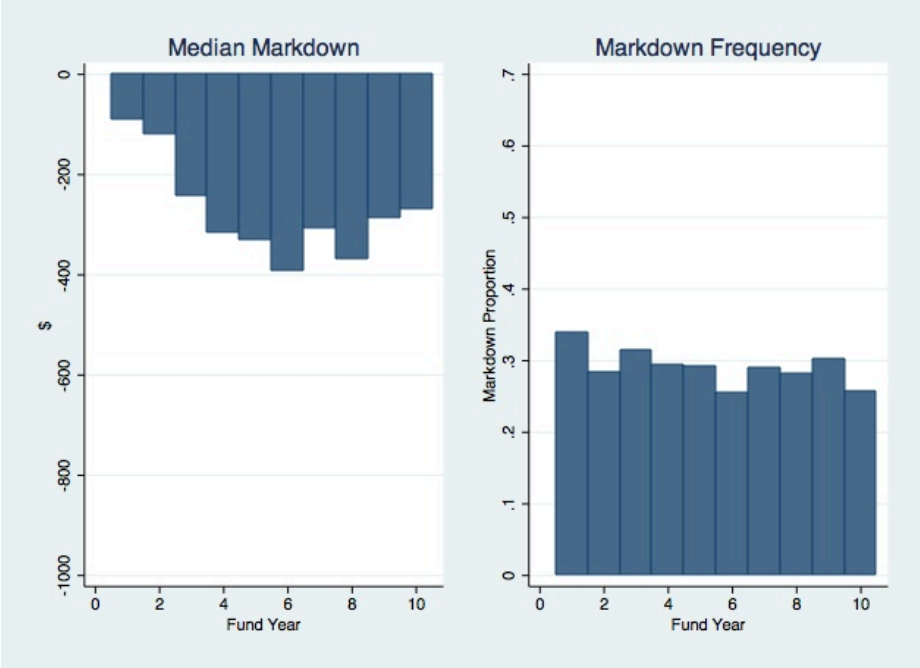
Panel A: Buyout Funds



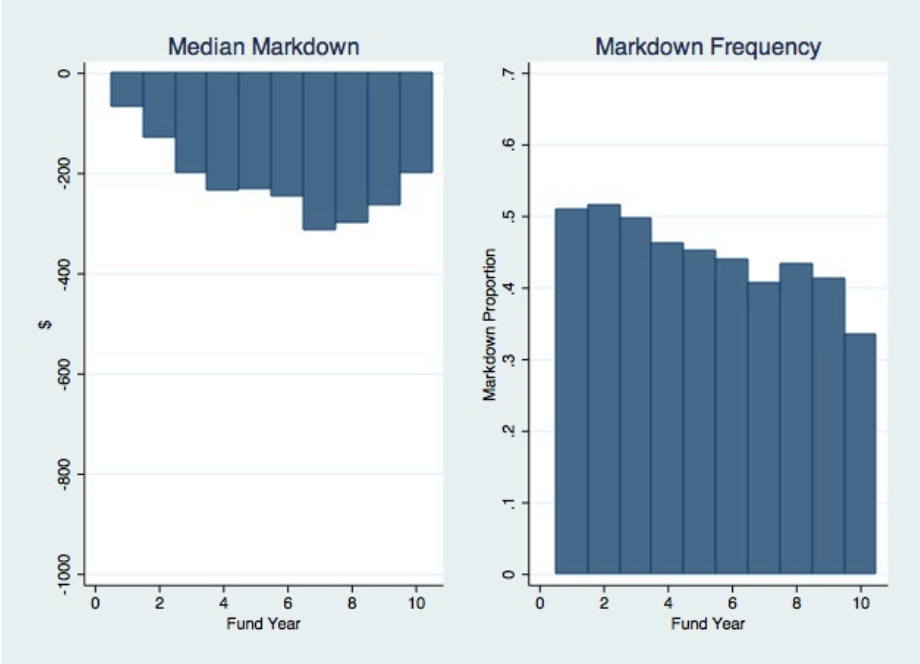
Panel B: VC Funds

Figure 5: Size and Incidence of NAV Markdowns by Fund Year

The figure presents the median size of nonzero markdowns (left graph) and incidence of markdowns (right graph) by year in a fund's life (fund year). Fund size (committed capital) is scaled to be $10,000 for all sample funds.



Panel A: Buyout Funds

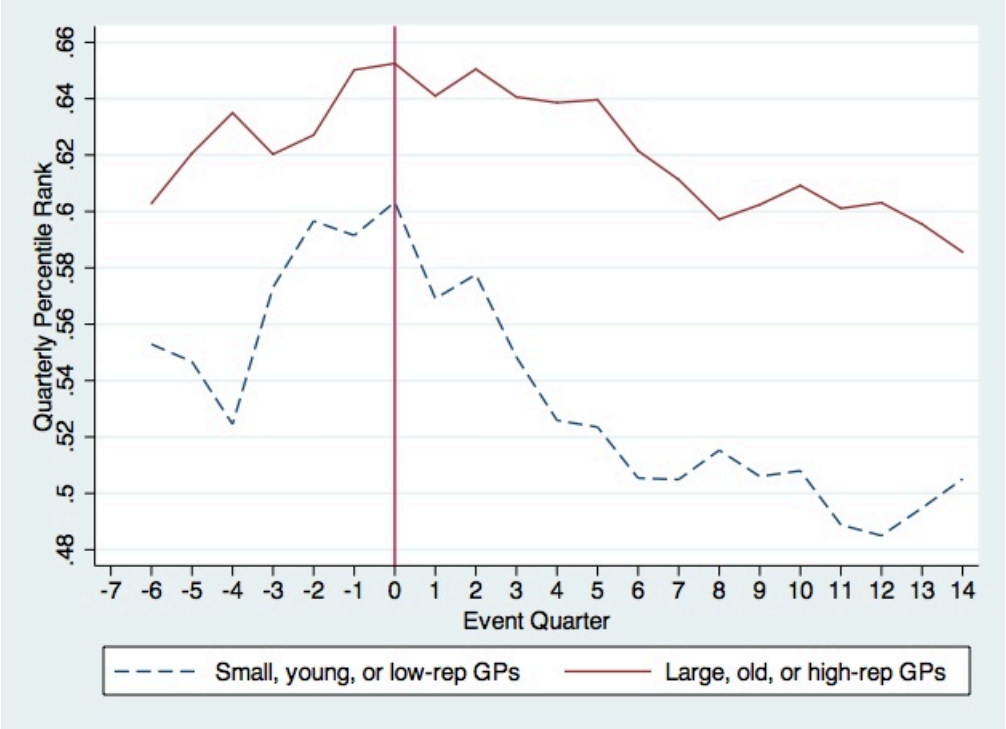


Panel B: VC Funds

Figure 6: Fund Percentile Rank in Event Time
This figure plots the mean percentile rank of VMs in event time, where t=0 is the quarter of a fundraising event.



Panel A: Buyout Funds



Panel B: VC Funds