Interim fund performance and fundraising in private equity ☆

Brad M. Barber*, Ayako Yasuda

Graduate School of Management, One Shields Avenue, University of California at Davis, Davis, CA 95616, United States

A B S T R A C T

General partners (GPs) in private equity (PE) report the performance of an existing fund while raising capital for a follow-on fund. Interim performance has large effects on 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: (1) exit and fundraise and (2) net asset value (NAV) management. Consistent with the former, performance peaks are greatest for funds with high realization rates. Consistent with the latter, low reputation GPs with low realization rates experience performance peaks and erosions in performance after fundraising.

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1. Introduction

"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, Enforcement Division Asset Management Unit
Securities and Exchange Commission speech at Private Equity International Conference, New York NY January 23, 2013

Investors participate in private equity (PE) primarily by making capital commitments to new funds that are run for

ten or more years, during which time their capital commitments are tied up in the funds. Typically, a PE fund manager raises 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 Security and Exchange Commission (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.

Prior work shows that successful fundraising is of paramount importance to the career goals of PE fund managers. Interim fund performance affects the ability to raise a follow-on fund (Chung, Sensoy, Stern, and Weisbach, 2012 and Hochberg, Ljungqvist, and Vissing-Jorgensen, 2014). 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. These two empirical observations lend credibility to the SEC's concerns about performance exaggeration during fundraising campaigns.

The accounting for the interim performance of a fund also offers wide reporting discretion. 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, 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 thus must 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 consider two questions: Do PE firms time their fundraising campaigns to coincide with periods when their current fund's interim performance is at its peak? Do PE firms upwardly manage their NAV valuations during the fundraising period and subsequently mark them down once the fundraising is concluded? To explore these questions, we use fund-level cash flow and quarterly NAV data for more than eight hundred US-focused private equity funds (both buyout (BO) and venture capital (VC) funds) raised between 1993 and 2009.

To set the stage, we begin by verifying the importance of interim performance on a GP's ability to raise a follow-on fund (Chung, Sensoy, Stern, and Weisbach, 2012; Hochberg, Ljungqvist, and Vissing-Jorgensen, 2014), which

is a key presumption of the SEC's concerns. 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, limited partners (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.

We extend the result in Chung, Sensoy, Stern, and Weisbach (2012) and Hochberg, Ljungqvist, and Vissing-Jorgensen (2014) along two important dimensions: (1) the reputation of the GP and (2) the verifiability of interim performance. These two dimensions modulate the impact of interim performance on fundraising success and become important in understanding the reporting dynamics around fundraising campaigns. We also show that the economic magnitude of the interim performance effect is much larger than that of other variables, such as overall PE market returns (market timing), performance of prior funds, and time lapsed since last fundraising.

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

We also conjecture that the verifiability of interim performance results matters. 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, and reported valuations (or NAVs) represent the estimated valuations of unexited companies. For an LP, it is much harder to verify a valuation of an unexited company than of a successfully exited company. Thus, LPs have more faith in the veracity of interim performance when it emanates from good exits, and interim performance that is backed by verifiable exits has a greater impact on the fundraising prospects of GPs.

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

[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, Richardson, and Wolfenson (2007) find that younger buyout GPs invest in riskier buyouts in an effort to establish a track record.

The impact of realizations on fundraising prospects is arguably more important for low reputation 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 important. Successful exits, while helpful, would not turn the dial on fundraising prospects as much for this group compared with 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 buy-out 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 reputation 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 reputation GPs.

These timing results are consistent with two noncompeting explanations. GPs could 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.[5] The exit and fundraise strategy, when combined with generally conservative accounting of the valuation of portfolio companies[6], would generate the peak performance pattern that we show and would not require that GPs inflate

NAVs (the exit and fundraise hypothesis). Alternatively, GPs could upwardly manage valuations in an attempt to exaggerate the interim performance of the current fund and impress prospective investors (the NAV management 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 funds with high realizations. The NAV management hypothesis predicts peaking in both high realization and low realization funds. Consistent with the exit and fundraise story, we find that peaking is most obvious for funds with high realizations rates at the time of fundraising. However, consistent with the NAV management hypothesis, we continue to observe performance peaks for low realization funds, but only among low reputation 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 reputation GPs with few realizations.

Second, to investigate whether the erosion in the performance rank is partially attributable to NAV management during the fundraising period, 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 find that the size and the frequency of NAV markdowns significantly increase in the post-fundraising periods, but this result can be traced entirely to NAV markdowns for low reputation GPs with low realization rates. These results dovetail with the observation that the low reputation GPs with low realization also present some evidence of performance peaking and lend further credibility to the notion that some low reputation GPs upwardly manage valuations at the time of fundraising.

Third, 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 find 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 reputation GPs and, importantly, is largest for low reputation 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 low reputation GPs, 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 management. Funds with low realization rates at the time of fundraising also

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[3] See Chung, Sensoy, Stern, and Weisbach (2012) and Boleslavsky, Carlin, and Carter (2016).

[4] Our results are not about timing with respect to overall market performance (the hot market effect) discussed by Gompers and Lerner (1998b), Kaplan and Schoar (2005), and Robinson and Sensoy (2011) since we analyze the performance rank of a fund relative to funds from the same vintage-year cohort.

[5] In PE, investments are exited most commonly via initial public offerings (IPOs) or sales. Once exits occur, exit proceeds are distributed back to the LPs without reinvestments, and the exited companies are no longer part of the fund's portfolio from that point on. Thus, the well-documented post-IPO underperformance of newly public firms does not explain the post fundraising decline in PE fund performance consisting of portfolio companies that remain unexited and private (especially for buyout funds, most of which are diversified across many industry sectors).

[6] We show in Section 5.3.1 that PE investments in portfolio companies are valued on average at 24–56% below the final exit values in the quarter prior to the exit quarter. See details in footnote 22.

experience performance peaks, but only among low reputation GPs. Further, low reputation 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.

2. Related literature

Our results complement those in two recent working papers that examine related questions. Brown, Gredil, and Kaplan (2016) use fund-level data provided by Burgiss and analyze the time series variation in performance of the cumulative, value-weighted cross sectional average of change in public market equivalent (PME), in which the value weight for fund i at time t is the size of the ratio of NAV at $t-1$ for fund i to fund i's cumulative calls to date adjusted for public market returns, relative to the same ratios for other funds at time t. This return time series, interpreted as the risk-adjusted, group-average excess returns, does not decline around fundraising events for the fundraiser GP group. In contrast, the weighted-average return series peaks and declines near the end of a fund's life for the group of GPs that are ultimately unable to raise follow-on funds. Brown, Gredil, and Kaplan interpret this result as evidence of NAV inflation by unsuccessful and desperate GPs but conclude that investors see through the manipulations.

Jenkinson, Souse, and Stucke (2013) use fund-level data for PE investments made by the California Public Employees' Retirement System (CalPERS) and find that quarterly changes in NAV valuations become more positive in quarters during fundraising campaigns and more negative three to six years post-fundraising, which is consistent with our observation that the size and frequency of markdowns increase in the post-fundraising period. Jenkinson, Souse, and Stucke conclude that valuations are inflated during fundraising, with a gradual reversal once the fundraising is concluded.

Our work is distinguished from these two contemporaneous papers in three main ways. First, we extensively analyze the importance of GP reputation in modulating the effects of interim performance on fundraising success, performance peaking, and post-fundraising performance. GPs with significant accumulated reputation capital likely have less incentive to inflate the valuations of their current fund because high reputation GPs can point to their prior success when raising capital and can tarnish their reputation by inflating NAVs (if subsequently revealed) during the fundraising period. In contrast, investors have less precise priors about younger, less established PE firms and could update their beliefs more drastically based on the interim performance of the current fund alone (as compared with the long track record of a venerable PE firm). We show that the impact of interim performance on fundraising success is greater for low reputation GPs. While low reputation GPs can elevate their fundraising success by employing an exit and fundraise strategy, we also show that low reputation GPs with below median realizations improve their chances of fundraising success by showing strong interim

performance, exhibiting performance peaking, and (critically) having increased size and incidence of NAV markdowns and performance erosion in the post-fundraising period. These results support the view that low reputation GPs have the greatest temptation to engage in NAV management.

Second, we extensively analyze the importance of strong distributions (exits) in each of our key results (interim performance, performance peaking, and post-fundraising performance). We find that interim performance is more important for fundraising success when it is backed by good exits. This suggests that the LPs discipline the GPs by leaning more on verifiable performance when making capital commitment decisions. Importantly, we condition the sample funds on both the GP reputation and the realization status of the fund at the time of fundraising to sharpen our inference on the performance peaking result. Neither Jenkinson, Sousa, and Stucke (2013) nor Brown, Gredil, and Kaplan (2016) use the two-way sort on reputation and exits to distinguish between the innocuous timing (exit and fundraise) explanation and more nefarious NAV management explanation. The fact that low reputation, low realization GPs exhibit performance peaking, while high reputation, low realization GPs do not, is indicative that NAV management is at least part of the story and that the LPs (at least during the sample period analyzed in this paper) did not always sufficiently discipline the GPs so as to deter such behavior. We further complement the performance peaking analysis with the post-fundraising performance analysis and show that the NAV markdowns become more negative post-fundraising only for low reputation, low realization GPs. This set of analyses helps reconcile the opposing views expressed by the other papers.

Third, we uniquely emphasize the importance of relative, or peer-adjusted, interim performance as a determinant of fundraising success by measuring percentile ranks among its vintage year cohort funds. This follows 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] Because the lack of time-weighted returns and sample selection issues makes 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 could gain more from timing their fundraising to coincide with the period in which their relative percentile rank vis-à-vis vintage year cohorts is at its maximum instead of choosing to fundraise when the fund's internal rate of return (IRR) itself is at its lifetime maximum. Finally, the use of performance ranks

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[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 can change in the future if the necessary data to compute PMEs become easily available to prospective investors. As of 2016, 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. See Korteweg and Nagel (2016) and Sorenson and Jagannathan (2014) for more generalized analysis and extension of the PMEs.

naturally controls for two important characteristics of private equity performance: (1) significant variation exists in overall macroeconomic conditions across vintage years and (2) standard performance measures (e.g., IRRs 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 (2016) use portfolio company data for a sample of VC funds and provide evidence that dovetails neatly with our analysis. They show that, after fundraising, VC funds write off past portfolio company investments more often, and their investments done after fundraising have lower returns and a lower probability of successful exit.[9] These results are 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.[10] In another recent working paper, Hüther (2016) analyzes publicly traded stock investments of 138 US buyout funds and finds that interim performance is more important for fundraising success when it is backed by investments in publicly traded stocks than when it is backed by unrealized private company investments. This finding is consistent with our observations that the verifiability of investments modulates the effect of interim performance on fundraising. Hüther (2016) also finds evidence that GPs delay write-offs until after raising a new fund.

3. Fundraising in the private equity industry

Typically, private equity funds are organized as limited partnerships, with private equity firms serving as general partners of the funds and large institutional investors and wealthy individuals providing the bulk of the capital as limited partners. 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 GP of the current fund begins a fundraising campaign that lasts anywhere from 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 fund performance, private equity fund performance is reported using internal rates of return and value multiples (VMs).[11] Before the Freedom of Information Act (FOIA) forced large public LPs to disclose the returns of individual funds in which they invested, leading to

the 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 the anonymity of individual funds that provided them with their performance data. 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 equity funds. Because measuring risk for individual funds is very difficult, the dominant performance measures in the industry are these vintage year comparisons.

3.1. Interim performance and fundraising

Chung, Sensoy, Stern, and Weisbach (2012) and Hochberg, Ljungqvist, and Vissing-Jorgensen (2014) show that interim fund performance positively affects the ability to raise a follow-on fund, a key presumption underlying the SEC's concerns regarding the reporting of interim performance. However, the impact of interim performance should depend on GP reputation and the verifiability of the reported performance.

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 that have raised relatively little capital in the past or that have never had a top quartile fund before (the 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 performance GPs with previous top quartile funds rely less on the current fund's interim performance to appeal to their prospective investors. Hence we predict their ability to raise funds will be less sensitive to the interim performance of existing funds.

We also conjecture that the verifiability of interim performance modulates the impact of interim performance on fundraising success. A GP that reports strong interim performance that is backed predominantly by successful exits has a more credible signal of recent success than a GP that reports only NAVs of unexited investments.

We begin our analysis by verifying prior results, which show that interim performance affects fundraising success. We analyze the impact of interim performance on the probability of successfully raising a follow-on fund and the size of the follow-on fund. We then extend these results by examining whether GP reputation and interim performance backed by exits modulates the impact of interim performance on fundraising. Formally, we test the following hypotheses:

H1a. The effect of interim performance of a fund on a GP's fundraising success is greater for low reputation GPs.

H1b. The effect of interim performance of a fund on a GP's fundraising success is greater when interim performance is verifiable (i.e., backed by exits).

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[9] 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 (2016) finds that, conditional on achieving a good performance early in a fund's life and thus securing a follow-on fund, GPs subsequently increase the riskiness of their fund portfolios.

[10] See also Arcot, Fluck, Gaspar, and Hege (2014) and Degeorge, Martin, and Phalippou (2016) for evidence of strategic participation in SBOs (secondary buyouts) by fundraising GPs.

[11] 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.

3.2. 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. Empirically, we formally test a 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 low reputation GPs.

3.3. Mechanisms that generate peak performance

3.3.1. Exit and fundraise

Evidence in favor of the timing hypothesis (H2) does not necessarily imply that GPs are upwardly managing reported valuations to influence their performance ranking. For example, GPs could 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 could occur naturally if the companies held in the current fund have average performance in the post-fundraising period. A GP could 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 could 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 it does not necessarily imply valuations are inflated at the time of the fundraising event.[12]

To test for evidence of the exit and fundraise strategy, we compare the performance ranks of a 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. Empirically, we formally test H2a.

H2a. 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.

3.3.2. NAV management

Evidence in favor of the exit and fundraise strategy does not rule out the possibility that GPs upwardly manage valuations at the time of fundraising. To see if evidence exists consistent with NAV management at the time of fundraising, we conduct three analyses. First, we examine whether the performance peak around fundraising is also detected among the GPs with low realization status and whether this is more pronounced for low reputation GPs than for high reputation GPs. If the exit and fundraise channel is the only mechanism that generates performance peaking around fundraising, we would not expect to observe performance peaks among GPs that fundraise but do not have high realization rates regardless of GP reputation. In contrast, if the NAV management strategy is also in play, we would expect to observe more performance peaking among low reputation GPs conditional on their having low realization status. Empirically, we formally H2b.

H2b. Among the low realization status GPs, the performance rank of a GP's current fund peaks during the fundraising period for a follow-on fund more when the fund is managed by low reputation GPs.

Our last two tests focus on the evolution of NAV after the fundraising period. In one test, 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 upwardly managed at the time of a fundraising event, we expect to observe larger and more frequent markdowns following fundraising events. In the other test, 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 hypotheses H3 and H4 related to the NAV management hypothesis.

H3. The size and frequency of NAV markdowns increase following fundraising events.

H4. 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 reputation 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 low reputation GPs versus other GPs conditional on the realization status of the fund at the time of fundraising.

In summary, we investigate the following questions in this paper: Do GP reputation and verifiability of exits modulate the effect of interim performance on a GP's fundraising success? 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 to time fundraising (the exit and fundraise hypothesis)? Is there evidence that GPs upwardly manage valuations when engaging in fundraising for a follow-on fund (the NAV management hypothesis)?

Overall, we find strong support for each of our hypotheses. Interim performance rank has a material impact on the

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[12] The fact that PE fund managers practice accounting conservatism itself is consistent with NAV management (albeit one of a generally conservative kind) and suggests that the PE fund NAV is not a random walk, but rather it exhibits mean reversion.

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 reliable evidence exists of erosions in post-fundraising performance for buyout funds. In general, these effects are most pronounced for low reputation GPs. Moreover, we separately analyze buyout and VC funds and find generally similar patterns for the two types of funds.

4. Data and descriptive statistics

4.1. 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 allow 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 and performance benchmarks, as well as fund type, vintage year, and size. We use this database to construct our key fund manager attributes.

While both Preqin databases are global and span multiple fund types, we focus our analysis on the US buyout and venture capital funds. This is primarily because our research design requires us to measure relative performance ranking among peer groups that are matched on vintage year, fund type (BO or VC), and region (US). By focusing on the US 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 US 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 US 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.

4.2. 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 to 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 and Preqin's benchmark VM by vintage year. The correlation is 92% for BO funds and 94% for VC funds. Because 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]

5. Methods

5.1. Test of the incentive hypothesis

5.1.1. 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. 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 ten 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 five 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 typically starts low at the beginning of a fund's life, rises in

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[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 yield downwardly biased performance estimates for buyout funds. See also Sensoy, Wang, and Weisbach (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 and 2006.

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 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 six buyout (BO) and six venture capital (VC) funds.

Vintage year	Number of Funds	Value multiple		IRR (percent)		Fund size (Millions of dollars)		
		Mean	Median	Mean	Median	N	Mean	Median
Panel A: BO 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	1487	1053
2001	17	1.79	1.84	19.3	19.7	17	1196	650
2002	15	1.58	1.80	14.4	16.6	15	1016	500
2003	11	1.60	1.49	13.2	11.7	11	1928	1163
2004	27	1.68	1.66	14.1	12.6	27	939	450
2005	46	1.38	1.30	8.5	7.2	44	1497	788
2006	42	1.19	1.20	4.2	6.3	41	3039	1000
2007	47	1.27	1.24	10.2	8.6	46	2603	1000
2008	38	1.29	1.29	13.7	15.3	38	2007	653
2009	21	1.20	1.16	15.9	12.3	19	1707	915
All funds	425	1.47	1.37	11.1	10.2	419	1532	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

the middle, and declines toward the end. 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 a failure event for fund n managed by GP i as the conclusion of fundraising for its next fund $n + 1$. A GP is allowed to fail anytime during fund n's lifetime for up to ten 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 conclusion 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.[14]

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

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

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.

Fig. 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

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[14] Fundraising campaigns can span many quarters, and we use the first cash flow of the follow-on fund as an approximation for the conclusion of

the most intense period of fundraising campaigns. Typically, a GP would not make its first capital call from the new fund until after it has received enough LP commitments to meet its minimum target fund size and held the first closing. Thus, we expect the fundraising efforts to be the most intense in the several quarters prior to the quarter in which we observe the first cash flow.

Panel A: Buyout funds
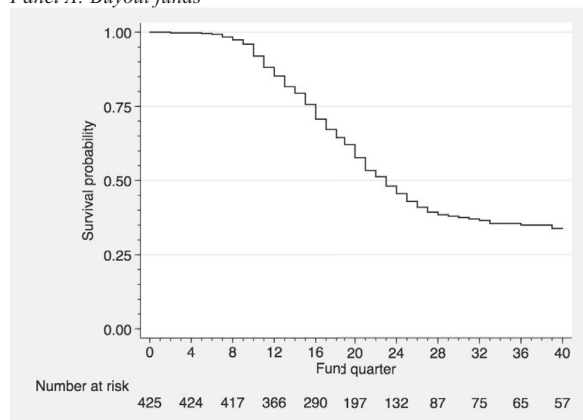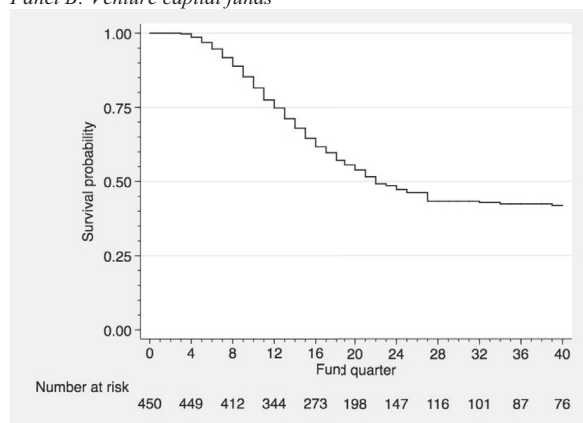

Panel B: Venture capital funds

Fig. 1. Kaplan-Meier survival graph for private equity fundraising events. This figure shows the probability that a fund does not engage in a fundraising event by quarter. The number at risk displayed at the bottom of each graph represents the number of funds that have yet to raise a follow-on fund.

presents the graph for BO funds; Panel B, the result for VC funds. The figure 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*.[15] 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 that have neither failed (engaged in

a fundraising event) nor otherwise been censored by that point.

The graphs indicate that most fundraising events for BO fund GPs occur between year 3 and year 8 (quarter 8 and quarter 31), as the curve is fairly flat before quarter 8 and after quarter 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-fifths) of BO (VC) fund GPs in our sample have not raised follow-on funds by the end of the current funds' tenth year.[16]

Because 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. $h_0(t)$ in the Cox proportional hazard model nonparametrically captures this shape and imposes a common shape to all individual funds in the sample.[17] Further, the model allows the individual funds to vary in their hazard rate parametrically (both cross-sectionally and over time), 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 identify funds in the top three performance quartiles relative to its vintage year cohort funds.[18] To calculate the performance rank used to construct the dummy variables, we follow a two-step process. 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

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

In the model, we use the lagged interim percentile rank for quarter *t*−1 as an explanatory variable for fundraising at quarter *t*. 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 (millions of dollars, Ln *Fund Size*), and the annual return on the Cambridge Associates PE or VC index through quarter *t*-1 (*BO Mkt. Ret.* 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 low reputation and high reputation GPs.

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[15] 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: $\hat{S}(t) = \prod_{i=1}^{t} \frac{n_t - d_t}{n_t}$. 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 observe the cash flow activities of only of fund I and III. We would then code fund I as never raising a follow-on fund during its first ten 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.

[16] The estimated hazard functions are available upon request and indicate that fundraising success peaks in the middle years of the current fund's life (between year 4 and 5 for buyout and between year 3 and 4 for VC).

[17] In earlier drafts of this paper, we also estimate linear and quadratic models and obtain qualitatively similar results.

[18] We require a minimum cumulative realization of $50 (for a scaled fund size of $10,000) for a fund to be considered high realization.

Panel A: Buyout funds
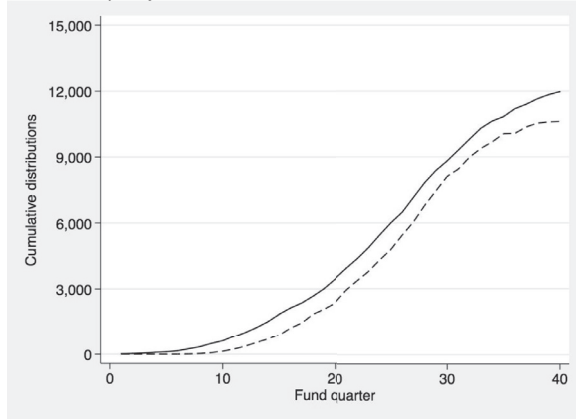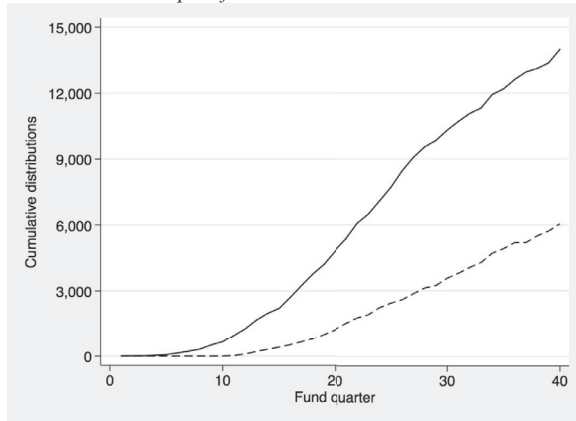

Panel B: Venture capital funds

Fig. 2. Mean and median realizations by fund quarter.
This figure shows the mean (solid line) and median (dashed line) cumulative realizations (or distributions) by fund quarter.

Low reputation GPs are small, young GPs that lack a strong past track record, which we define as GPs that have cumulative capital raised prior to the sample fund of less than $1 billion for BO funds ($250 million for VC) (small), that have raised fewer than three funds in the past (young), and that have no top quartile performing funds that are more than five years old as of the inception of the sample fund (low performance). High reputation GPs are the complement to low reputation GPs (i.e., they are large, are old, or had a top quartile fund).

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 as of the end of quarter $t-1$, defined as a fund in which the value of realizations (scaled by committed capital) of the fund is 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 performance GPs versus others) and the realization status of the fund at the time of fundraising (high versus low).

In Fig. 2, we plot the mean (solid line) and median (dashed line) realization rates for a normalized capital commitment of $10,000 for our BO (Panel A) and VC sample (Panel B) by fund quarter (horizontal axis). For both BO 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 a GP is raising a follow-on fund in this early investment period, any realizations in the GP's current fund would be put it in the high realization group.[19] 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 BO realizations is also evident as the median and mean realizations are very similar for BO but different for VC.

5.1.2. 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, as larger funds also redound to the benefit of the GP. To do so, we estimate a regression in which 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 for the duration model but adapted to accommodate the fund-level nature of the Tobit model analysis. 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 3 to 7 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 first averaging across quarters 13 to 28 and then 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).[20]

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 (millions of dollars, Ln *Fund Size*), the number of years between the first cash flow of the current and

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[19] We are forced to make these assumptions in the Tobit analysis with only one observation per fund. In contrast, in the duration model analysis with one observation per fund-quarter, we use the lagged quarterly observations of quartile dummy variables and lagged realization status variable as of $t-1$.

[20] For non-fundraisers in the Tobit model analysis (not in the duration model), 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 quarter 28 of the fund's life.

follow-on fund (*Time since Last Fund*), and the annual return on the Cambridge Associates PE or VC index through the last fundraising quarter (*BO Mkt. Ret.* or *VC Mkt. Ret.*).[21] To account for the fact that growth is bounded from below at −100%, we estimate these models using a Tobit specification.

5.2. 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 +7, where quarter $t = 0$ is the fundraising quarter. If the current fund's interim performance peaks around the fundraising event, then significantly positive excess ranks would be predicted around $t = 0$.

The timing hypothesis (H2) predicts that the excess rank for fundraising GPs peaks 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 low reputation GPs (small, young, and low performance) and high reputation GPs (large, old, or high-performance).

5.3. Tests of exit and fundraise and NAV management hypotheses

To determine whether successful exits can partially or completely explain our peaking results (H2a), 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. 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.

To determine whether NAV management strategy is also in play, we examine whether the performance peak around fundraising is also detected among the GPs with low realization status and whether this is more pronounced for low reputation GPs than for high reputation GPs (H2b).

5.3.1. NAV markdowns

In the next set of tests, we analyze the size and frequency of markdowns after the fundraising period (H3). The NAV management hypothesis maintains that GPs upwardly manage NAVs 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 can mark down the valuation of portfolio companies, or (2) a GP can 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 increases the NAV of a fund by $100 and a $100 distribution decreases 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 because portfolio companies are generally held at valuations below their exit values.[22] However, this assumption ensures that when we observe a decline in NAV that exceeds the value of the exited investment, we have 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

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

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 Eq. (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 BO samples.

For BO funds, the mean reported NAV is approximately $5500 on a scaled LP capital commitment of $10,000. The average call and distribution is small (less than $300) because many quarters have no calls or distributions. We observe calls in 60% of BO fund quarters and distributions in 46% of fund quarters. For VC funds, the mean reported NAV is approximately $5400. 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 BO distributions. In Fig. 3, we plot the average NAV and the interquartile range of NAVs for our sample funds through quarter 40. Predictable variation is evident in the average NAV, which peaks around quarter 20 (year 5) and then declines as the fund reaches maturity.

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[21] 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, 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.

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

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 limited partner 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).

| Variable	N	Mean	Standard deviation	25th percentile	Median	75th percentile
Panel A: 422 BO funds						
NAV	9015	5522.1	3107.3	3205.4	5285.7	7502.9
Distributions (D)	9015	290.9	767.0	0.0	0.0	193.7
Nonzero D	4125	635.7	1032.7	48.4	250.0	764.9
Calls (C)	9015	254.2	484.1	0.0	20.4	306.7
Nonzero C	5444	420.9	563.8	45.0	200.0	626.7
Markdown (MD)	9015	−162.6	531.2	−67.8	0.0	0.0
Nonzero MD	2537	−577.7	873.5	−659.7	−270.9	−110.6
Panel B: 440 VC funds						
NAV	10,143	5363.1	6251.1	2828.1	4585.5	6555.4
Distributions (D)	10,143	250.5	1681.8	0.0	0.0	0.0
Nonzero D	2,551	996.1	3241.4	124.3	371.5	922.3
Calls (C)	10,143	231.0	354.8	0.0	0.0	400.0
Nonzero C	5,141	455.8	381.9	200.0	400.0	575.0
Markdown (MD)	10,143	−259.2	1244.5	−187.1	0.0	0.0
Nonzero MD	4,517	−582.0	1813.8	−521.0	−225.5	−100.0

Panel A: Buyout funds
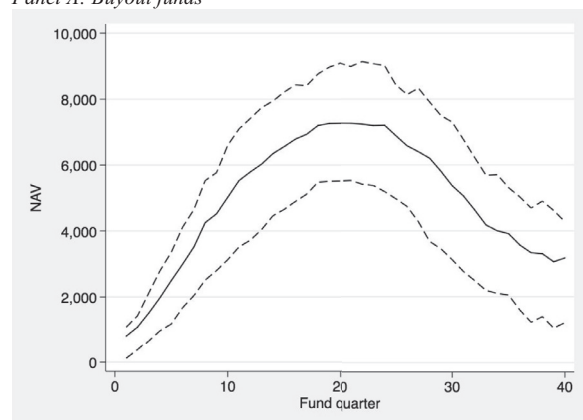
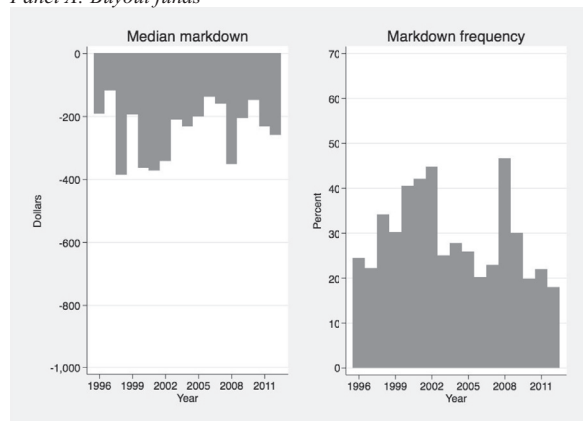*Panel B: Venture capital funds*
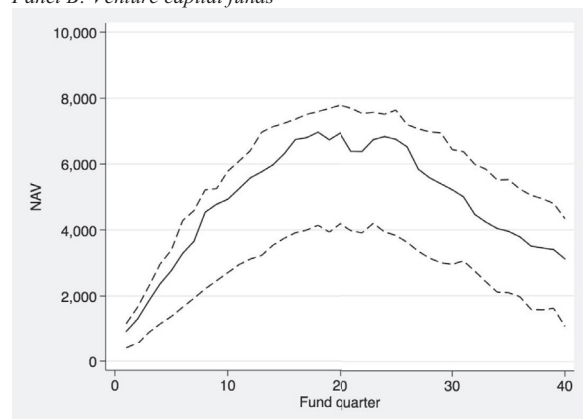
Fig. 3. Net asset value (NAV) by fund quarter.
This figure presents the mean (solid line) and 25th and 75th percentiles (dashed lines) of NAVs by fund quarter. Fund size (committed capital) is scaled to be $10,000 for all sample funds.

In Table 2, the key dependent variable of interest is the size and incidence of markdowns. For BO funds, markdowns occur in 28% of fund quarters and the mean markdown is −$163. Conditional on observing a markdown, the interquartile range for markdowns is −$111 to −$670. Markdowns are more common (occurring in 45% of fund quarters) for VC funds, though the size of the VC markdowns conditional on their observation is in the same ballpark as those observed for BO.

For both BO 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 Fig. 4, we present the median markdown (conditional on observing a markdown) and markdown incidence by calendar year for BO (Panel A) and VC (Panel B) funds. For BO funds, the size of markdowns varies across years from about -$100 in 1997 to about -$400 in 1998, 2000–2002, and 2008. The incidence of markdowns for BO funds also peaks in 2000 to 2002 and 2008. More variation exists 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 some variation exists in the size and incidence of markdowns over a fund's life, this variation is modest relative to that across calendar years. Fig. 5 presents the median markdown (conditional on observing a markdown) and markdown incidence by year in a fund's life. For both BO 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 4 through 10. In contrast to the size of markdowns, a steady decline appears in the incidence of markdowns over a fund's life (with a somewhat steeper decline for VC funds).

Panel A: Buyout funds

Panel B: Venture capital funds
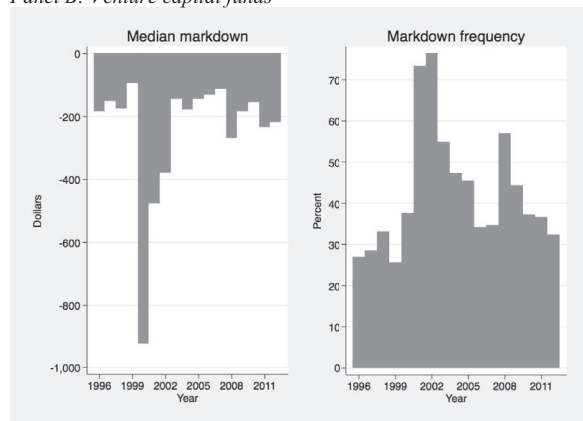
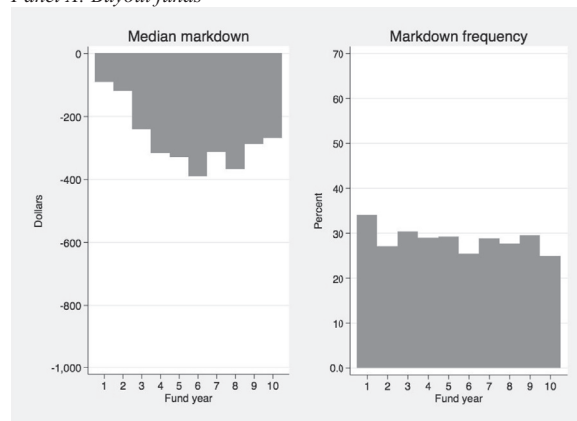**Fig. 4.** Size and incidence of NAV markdowns by year. This figure presents the median size of nonzero markdowns (left graphs) and incidence of markdowns (right graphs) by year. Fund size (committed capital) is scaled to be $10,000 for all sample funds.

Panel A: Buyout funds

Panel B: Venture capital funds

Fig. 5. Size and incidence of net asset value (NAV) markdowns by year. This figure presents the median size of nonzero markdowns (left graphs) and incidence of markdowns (right graphs) by year in a fund's life (fund year). Fund size (committed capital) is scaled to be $10,000 for all sample funds.

Our key independent variable of interest is a dummy variable (*POSTFUND*) that takes a value of one in periods after a fundraising event. $POSTFUND_{iq}$ 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.[23] The NAV management hypothesis predicts that upwardly managed 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 in which the dependent variable is the size of a markdown in quarter q for fund i (MD_{iq}):
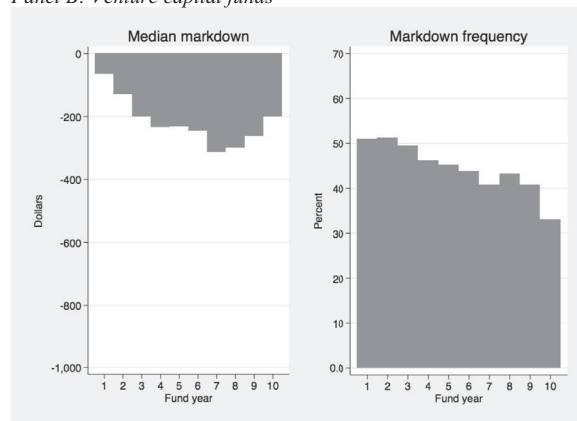
$$MD_{iq} = a + bPOSTFUND_{iq} + \mu_y + \mu_q + \varepsilon_{iq} \qquad (4)$$

As a further robustness check to ensure that our results are not driven by a few large markdowns, we estimate a conditional logit regression in which 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.[24] The coefficient estimate on the key *POSTFUND* variable is an estimate of whether the size or incidence of markdowns is large in the period following fundraising relative to other funds at the same stage of the fund's life (fund quarter fixed effect) and in the same general market conditions (calendar year fixed effect). To test our ancillary

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[23] 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 low reputation GPs. However, these results could be driven by low rates of markdowns in the period leading up to the fundraising event instead of high levels of markdowns in the post-fundraising period. By dropping fund fixed effects, we are comparing the performance of fundraisers with all funds after taking out calendar year and fund quarter fixed effects.

[24] In prior drafts of this paper, we also estimate models in which 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 that performance ranks affect the hazard rate at a decreasing rate.

prediction that the size and frequency of markdowns in the post-fundraising periods vary with GP reputation and realization status, we estimate the coefficient on the key *POSTFUND* dummy conditional on GP reputation and conditional on the interaction of GP reputation and the realization status of the fund.

5.3.2. Pseudo value multiples and post-fundraising performance

The advantage of the markdown analysis outlined in the Section 5.3.1 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 (H4). To do so, we introduce the concept of a pseudo value multiple, 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:

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

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 we 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 ten BO funds and eight of the ten raise a follow-on fund. The eight funds that raise a follow-on fund yield seven fundraising events (two funds have a common fundraising quarter of 1997Q3). Thus, there are seven 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 (eight PVMs for fundraisers and 62 PVMs for non-fundraisers across the seven 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 regression

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

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. 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.

6. Results

6.1. Test of the incentive hypothesis

6.1.1. 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 uses separate baseline hazard rates 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 third quartile (relative to being in the bottom quartile) is 2.386 for BO funds and is statistically significant at the 1% level. (All significance levels represent tests of two-sided null hypotheses unless otherwise noted.) This implies that a fund in the third quartile has a hazard ratio of 2.386 times that of a fund in the bottom quartile category. Likewise, a fund in the second (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 third or second 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 second quartile. Thus, for VC funds, there appears to be relatively little difference between being in the second and top quartile brackets, whereas for BO funds more measurable improvement is evident in the hazard ratio. Furthermore, the impact of a unit change in the interim performance rank has greater positive impact 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 third to second or second to top quartile.[25] Overall, these results are consistent with those in Chung, Sensoy, Stern, and Weisbach (2012) and Hochberg, Ljungqvist, and Vissing-Jorgensen (2014).

We extend these results in two ways. First, we investigate whether these results vary by GP reputation (H1a). Columns 2a and 2b of Table 3 report the estimation results in which the model specification is the same as in Column

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[25] Exp(0.164*coefficient) = exp(0.164*ln(12.085)) = 1.507. Hazard ratios, not coefficients, are reported in Table 3. Thus, we need to take the natural log of the hazard ratio (12.085) to obtain the coefficient.

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, general partner (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 buyout (BO) funds; Panel B, for venture capital (VC) funds. A failure event (i.e., a fundraising event) is defined as the quarter in which either a cash flow activity or a net asset value (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 ten 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 past performance versus large, old, or high past performance). The third model is presented in Columns 3a–3d and considers the double interaction of interim performance with GP reputation and fund realization. The interim performance rank variable is the percentile rank of a fund's value multiple among its vintage year cohorts in quarter $t-1$. The top quartile (second quartile, 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). *BO Mkt. Ret. (VC Mkt. Ret.)* is the annual return on the Cambridge Associated BO (VC) fund index as of quarter $t-1$. Low reputation GPs are funds run by BO (VC) GPs that have cumulative capital raised prior to the sample fund of less than $1 billion ($250 million) (small), that have raised fewer than three funds in the past (young), and that had no top quartile performing funds that are more than five years old as of the inception of the sample fund (low performance). High reputation GPs are the complements of low reputation 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. *, **, and *** denote $p < 0.10$, $p < 0.05$, and $p < 0.01$, respectively.

	All funds (1)	Low reputation GPs (2a)	High reputation GPs (2b)	High realization Low reputation GPs (3a)	Low realization Low reputation GPs (3b)	High realization High reputation GPs (3c)	Low realization High reputation GPs (3d)
Panel A: BO 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)
Second 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)
Third 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)	
BO Mkt. Ret.	12.09***		12.13***			11.29***	
	(4.66)		(5.09)			(4.93)	
Number of fund-quarters	7768		7768			7768	
Number of funds	419		419			419	
Number of 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)
Second 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)
Third 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)	
Number of fund-quarters	8148		8148			8148	
Number of funds	442		442			442	
Number of fundraisers	205		205			205	

1 but the model is estimated as an interactive model with separate baseline hazard rates and coefficients for low reputation GPs (small, young, and low past performance), and high reputation GPs. By construction, low reputation GPs do not have a prior past top quartile fund, so this variable only appears for high reputation GPs. The BO (or VC) market return is not interacted with reputation (though results are qualitatively similar with the interaction). Low reputa-

tion GPs lack strong track records and are expected to need the good interim performance of the current fund the most to successfully engage in a fundraising event. Thus, we expect their fundraising probability to be more sensitive to the interim performance than that for high reputation GPs.

For BO funds, Column 2a in Panel A of Table 3 indicates that a much sharper increase in the fundraising probability is evident when a fund run by a low reputation GP

improves its interim performance from the bottom quartile to third, second, 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) for high reputation GPs in Column (2b). The differential impact of interim performance for the two subsamples is also evident in the coefficient estimates on the second and third quartile dummy variables. We are able to reject the one-sided test under the null hypothesis that low reputation GPs are less responsive to interim fund performance than high reputation GPs at $p = 0.07$ significance level for both the top and third quartile funds. For the second quartile funds, the p-values are just shy of conventional levels of statistical significance ($p = 0.12$). These results suggest that low reputation BO fund GPs have particularly strong incentives to demonstrate either the top or second quartile interim performance to succeed in fundraising.

For VC funds, the results are equally interesting, with some nuanced differences. For high reputation VC fund GPs, virtually no difference seems to exist in fundraising probability whether their current fund is in the top or second quartile category (3.347 versus 3.174), and being in the third quartile category is indistinguishable from being in the bottom quartile (1.374 and insignificant). Thus, beating the median is the main meaningful criterion when it comes to fundraising for established VC GPs. In contrast, the fundraising probability is significantly improved for low reputation 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 second and top quartile marks. We are able to reject the one-sided test under the null hypothesis that low reputation GPs are less responsive to interim fund performance than high reputation GPs for third quartile funds ($p = 0.03$). 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 second 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 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. We address this issue by comparing the hazard ratios associated with the two top quartile dummy variables: that for the current fund versus that for prior funds. Among all BO 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 one-third 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 high reputation GPs (Column 2b).

We also compare the economic magnitude of the effect of a current fund's performance with that of the overall market return. For example, consider the all fund results in Column 1 of Table 3 for BO (Panel A) and VC funds (Panel

B). A standard deviation increase in the annual BO market return (0.164) increases the hazard ratio of fundraising for all funds by 1.507, and this is less than one-third of that associated with having current fund with top quartile performance (5.679).[26] For all VC funds, a standard deviation increase in the annual VC market return (0.612) increases the hazard ratio by 1.667, and this is less than half of that associated with having a top quartile performance for a current fund (4.482).[27] In sum, managing a current fund with interim performance above the median of its cohort affects the GP's fundraising success with much greater magnitude than that associated with typical variation in market returns.

Finally, we analyze whether the verifiability of interim performance modulates the effect of interim performance on fundraising success (H1b). To do so, we estimate a model that 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, with each column reporting results of the key interactions between GP reputation dummy and the realization status dummy. For example, Column 3a presents results for low reputation GPs with high realizations, and Column 3d presents results for 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 *BO Mkt. Ret.*) when the coefficient is constrained to be constant across the columns.

Realizations are particularly important for the fundraising success of low reputation GPs among the BO funds. The combination of top quartile performance and high realizations increase the hazard ratio by 12.820 for these low reputation GPs. This effect is much larger than the hazard ratio of 4.371 observed for low reputation GPs with top quartile performance that is not backed by realizations (the difference is significant at $p = 0.005$ for a one-sided test under the null that high realization GPs are less responsive to interim performance than low realization GPs). This general pattern is also evident in the second 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 reputation GPs (see Columns 3c and 3d).

Subsequently, the modulating effect of realization status on the impact of interim performance is more pronounced for low reputation GPs than for high reputation GPs among the BO funds (one-sided p-value = 0.02). In contrast, among VC funds, the combination of top quartile performance and high realizations is important for both high and low reputation GPs. The hazard ratio of 7.530 (4.539) is significantly larger than 4.397 (2.301) for low reputation (high reputation) GPs (one-sided test p-value = 0.08 and $p = 0.02$, respectively), and the difference between the low and high reputation GPs is insignificant.

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[26] $\text{Exp}(0.612^{*}\text{coefficient}) = \exp(0.612^{*}\ln(2.305)) = 1.667$.

[27] $3.779^{*}0.164 = 0.622$ or 62.2%.

Table 4

Interim Performance Rank and the Size of Follow-on Funds.

This table presents results of three Tobit regressions in which 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 buyout (BO) funds; Panel B, for venture capital (VC) funds. The first model is presented in Column 1. The second model is presented in Columns 2a–2b and interacts interim performance with general partner (GP) reputation using separate baseline hazard rates for the reputation subsamples (small, young, and low past performance versus large, old, or high past performance). The third model is presented in Columns 3a–3d and considers the double interaction of interim performance with GP reputation and fund realization. For fundraisers, the interim performance rank variable is the percentile rank of a fund's value multiple (VM) 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 quarter 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 non-fundraisers, time since last fund is set to the 75th percentile of that for fundraisers. For fundraisers, BO (VC) Mkt. Ret. is the annual return on the Cambridge Associated *BO Mkt. Ret.* (*VC Mkt. Ret.*) fund index as of the quarter prior to fundraising; for non-fundraisers, it is the average annual return on the index from quarter 13 to quarter 28 of a fund's life. Low reputation GPs are funds run by BO (VC) GPs that have cumulative capital raised prior to the sample fund of less than $1 billion ($250 million) (small), that have raised fewer than three funds in the past (young), and that had no top quartile performing funds that are more than five years old as of the inception of the sample fund (low performance). High reputation GPs are the complements of low reputation 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 non-fundraisers, high realization dummy equals one if the average high realization status from quarter 13 to quarter 28 of a fund's life is above 0.5 and zero otherwise. *, **, and *** denote $p < 0.10$, $p < 0.05$, and $p < 0.01$, respectively.

	All funds (1)	Low reputation GPs (2a)	High reputation GPs (2b)	High realization Low reputation GPs (3a)	Low realization Low reputation GPs (3b)	High realization High reputation GPs (3c)	Low realization High reputation GPs (3d)
Panel A: BO 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)
Second 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)
Third 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)			
BO Mkt. Ret.	3.779***	3.643***		3.626***			
	(4.92)	(4.86)		(4.92)			
Number of 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)
Second 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)
Third 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)			
Number of Funds	409	409		409			

6.1.2. 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 BO funds, the coefficient estimates on the top, second, and third quartile dummies are 1.816, 1.229, and 0.751, respectively. These estimates indicate that, for BO 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, sec-

ond, or third quartile increases the size of the follow-on fund by 150%, 124%, and 79%, respectively. Also, as was the case for our hazard rate analysis, the impact of strong interim performance on fund size is economically more important than having a prior top quartile fund. For both BO and VC funds, the coefficient estimate on the past top quartile dummy in not reliably different from zero.

For BO funds, we see strong evidence of differences in these incentives when GPs are partitioned into low reputation GPs versus high reputation GPs. Interim performance is a much more important determinant of

follow-on fund size for low reputation GPs than high reputation GPs. These effects are economically large. For example, a top quartile BO fund for a low reputation GP increases the size of the follow-on fund by 293%, and for high reputation 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 significantly greater for low reputation GPs at conventional significance levels (one-sided p-value = 0.001, 0.02, and 0.003 for the top, second, and third quartile, 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 BO funds (Metrick and Yasuda, 2010a).

Interim performance is also an economically important determinant of fund size relative to other determinants. Consider Column 1 of Table 4 for BO (Panel A) and VC funds (Panel B). The coefficient of 3.779 for BO market return implies that a standard deviation increase in the BO market return (0.164) is associated with a 62% increase in the size of the follow-on fund, which is about one-third of that associated with having a current fund with top quartile performance (181.6%).[28] Similarly, for VC funds, a standard deviation increase in the VC market return (0.612) is associated with a 38% increase in the size of the follow-on fund, which is less than one-third of that associated with having a current fund with top quartile performance (150.0%). As for the years lapsed since fundraising, a standard deviation increase (1.658 years) in this variable is associated with a 54% smaller fund size for BO and 67% smaller fund size for VC GPs.[29] Overall, the interim performance has not only a statistically significant effect on the follow-on fund size, but the effect's economic magnitude is also large relative to those of other key determinants.[30]

Our final model interacts performance, GP reputation, and realization status in Columns (3a) to (3d). These results generally echo those of Section 6.1.1. The combination of top quartile performance and high realizations is particularly important for low reputation GPs, and this result is more pronounced for BO than VC funds. Among VC funds, the combination of top quartile performance and high realizations is important for both high and low reputation GPs.

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[28] -0.323*1.658=-0.536 or -53.6%.

[29] The results in Table 4 are qualitatively similar when we estimate standard errors based on observations clustered by vintage year.

[30] Some readers ask if initial public offering (IPO) lockup periods (typically 180 days or two quarters) drive our results for low realization funds (as the IPO would yield NAV markups when the portfolio company first lists but cash would not be distributed to the LP immediately). We do not believe this is likely for three reasons. First, if IPO lockups are driving our results for low realization funds, we should observe similar peaks for low reputation and high reputation GPs, but we observe reliable evidence of performance peaks only for the low reputation GPs. Second, if IPO lockups are driving our results, we should observe strong peaks for VC than BO because IPO exits tend to yield larger valuation effects for VC funds, but we observe peaks of similar magnitudes for both BO and VC funds. Third, we reestimate our results excluding the hottest IPO years for BO (2005 and 2006) and VC (1996, 1999, and 2000) using Table 4 in Ritter (2016). The untabulated results are qualitatively similar to those in Table 5.

Panel A: Buyout funds
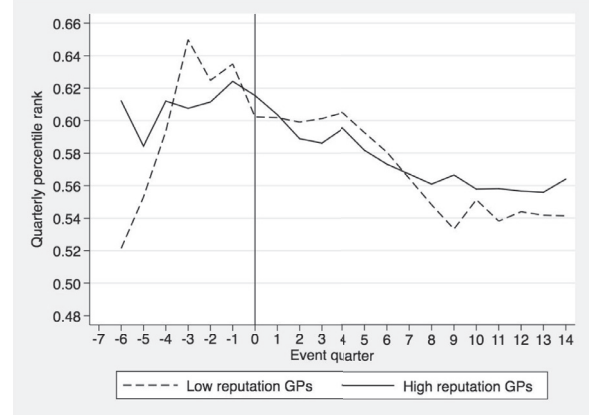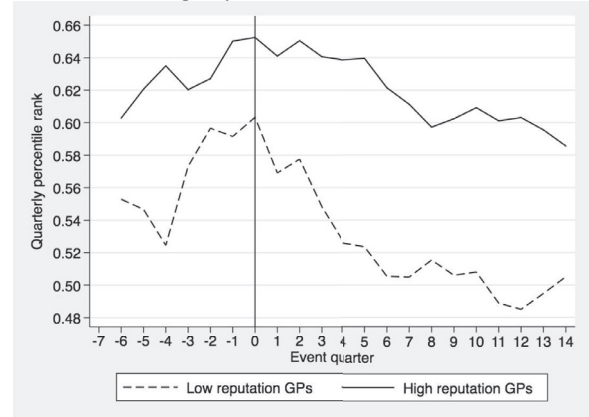

Panel B: Venture capital funds

Fig. 6. Fund percentile rank in event time.
This figure plots the mean percentile rank of value multiples in event time, where $t=0$ is the quarter of a fundraising event. GP=general partner.

Three takeaways emerge from our analysis of interim performance and fundraising outcomes. First, for both BO and VC funds, strong evidence exists that interim performance affects the probability that a GP is able to raise a follow-on fund. Second, the effect is more pronounced for low reputation GPs. Third, low reputation 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 reputation GPs and are most enthusiastic about interim performance that is backed by high levels of realizations. However, LPs do reward strong interim performance even when it is based solely or mostly on reported valuations of portfolio companies.

6.2. Event study test of timing hypothesis

To set the stage, we plot in Fig. 6 the mean percentile rank of funds based on value multiples in event time, where $t = 0$ is the quarter of a fundraising event. Thus, only funds run by GPs that have successfully raised follow-on funds by the end of the current funds' tenth fund year

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 buyout (BO) funds; Panel B, for venture capital (VC) funds. A fundraising event is the quarter when either a cash flow or net asset value (NAV) is reported for the first time for the general partner's (GP's) next fund. We allow the fundraising event to occur anytime in the fund's life up to ten years. Quarterly percentile rank for a fund-quarter is defined as the percentile rank of fund's value multiple (VM) 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. Low reputation GPs are funds run by BO (VC) GPs that have cumulative capital raised prior to the sample fund of less than $1 billion ($250 million) (small), that have raised fewer than three funds in the past (young), and that had no top quartile performing funds that are more than five years old as of the inception of the sample fund (low performance). High reputation GPs are the complements of low reputation 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. The number of funds equals the number of fundraiser funds in each of the GP groups. *, **, and *** denote $p < 0.10$, $p < 0.05$, and $p < 0.01$, respectively.

Event quarter	All funds (1)	Low reputation GPs (2a)	High reputation GPs (2b)	High realization Low reputation GPs (3a)	Low realization Low reputation GPs (3b)	High realization High reputation GPs (3c)	Low realization High reputation GPs (3d)
Panel A: BO Funds							
−7	−1.70%	−3.69%	−0.06%	−4.43%	−2.51%	1.91%	−2.28%
−6	1.00%	−2.54%	4.0%**	−1.42%	−4.31%	8.99%***	−1.63%
−5	0.94%	0.59%	1.25%	1.01%	−0.12%	6.39%***	−4.65%
−4	4.6%***	4.8%**	4.4%**	7.8%***	−0.19%	9.44%***	−1.55%
−3	6.3%***	9.1%***	4.0%**	10.3%***	6.99%**	11.07%***	−4.19%
−2	5.4%***	6.7%***	4.2%**	9.0%***	2.86%	7.37%***	0.55%
−1	6.2%***	7.7%***	5.0%***	8.9%***	5.72%*	8.17%***	1.06%
0	4.3%***	4.5%**	4.1%***	5.8%***	2.24%	6.60%***	1.09%
1	3.5%***	4.5%**	2.6%*	5.3%**	3.03%	3.32%*	1.86%
2	2.4%**	4.0%***	1.06%	6.1%***	0.45%	1.70%	0.30%
3	3.0%***	4.9%***	1.39%	5.9%***	3.15%	2.57%	−0.01%
4	3.9%***	5.6%***	2.5%*	8.4%***	1.11%	3.87%*	0.96%
5	2.4%**	4.3%***	0.86%	5.9%***	1.63%	2.60%	−1.10%
6	1.4%*	3.2%**	−0.15%	5.7%***	−0.81%	−0.48%	0.23%
7	0.78%	2.2%*	−0.49%	5.1%***	−2.09%	−0.81%	−0.12%
Number of Funds	204	93	111	58	35	61	50
Panel B: VC Funds							
−7	−2.09%	−1.56%	−2.49%	1.95%	−4.86%	−2.83%	−2.04%
−6	−0.37%	2.40%	−2.49%	9.97%*	−4.22%	−0.62%	−4.78%
−5	1.12%	2.22%	0.29%	4.66%	0.18%	4.10%*	−4.49%
−4	1.50%	0.21%	2.46%	4.52%	−3.16%	7.44%***	−3.30%
−3	2.5%*	4.1%*	1.34%	7.86%*	1.10%	9.98%***	−7.76%
−2	4.1%***	6.3%**	2.48%	10.63%***	2.84%	8.44%***	−3.79%
−1	5.4%***	7.0%***	4.3%**	11.24%***	3.53%	9.03%***	−0.71%
0	6.0%***	8.1%***	4.5%***	10.71%***	6.05%**	8.27%***	0.51%
1	4.2%***	5.4%**	3.4%**	5.45%*	5.30%*	5.62%***	0.98%
2	5.1%***	6.1%**	4.3%***	5.66%*	6.45%**	6.27%***	2.29%
3	3.3%***	3.7%**	3.0%**	3.53%	3.87%	5.71%***	0.10%
4	2.6%**	1.92%	3.1%**	2.74%	1.30%	5.11%***	1.13%
5	2.8%**	2.07%	3.3%**	3.45%*	1.05%	4.03%**	2.57%
6	1.12%	0.07%	1.88%	0.13%	0.03%	3.55%**	0.24%
7	0.93%	0.27%	1.40%	-0.85%	1.05%	3.44%**	−0.53%
Number of Funds	205	86	119	39	47	61	58

are included in the calculation. Furthermore, we split sample funds into two groups based on GP reputation. Panel A presents the result for BO funds; Panel B, the result for VC funds.

Several observations emerge from the figure. First, fundraisers have above median interim performance during the fundraising period (i.e., through event quarter $t = 0$). Second, in all cases, the peak performance rank occurs during this fundraising period. Third, all groups experience an erosion in performance post-fundraising. These patterns are consistent with performance peaking during fundraising events.

To formally test whether the fundraisers' performance peaks around fundraising, we conduct 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 funds, Columns 2a and 2b present results for low reputation GPs and high reputation GPs, and Columns 3a to 3d consider four partitions that interact GP reputation with realization status.

All fund results in Panel A indicate that BO fund GPs that fundraise are significantly above their own average percentile rank for 11 consecutive quarters between quarter −4 and quarter +6. For example, in quarter −3, the average BO fundraiser is ranked on average 6.3% better than its lifetime average percentile ranks ($p < 0.01$ versus the null hypothesis that the excess percentile rank is zero or

negative). Moreover, the subsample results show that the results are driven primarily by low reputation BO fund GPs. Low reputation fund GPs' excess ranks peak at 9.1% in quarter −3, and high reputation fund GPs' excess rank is only 5.0% at its peak in quarter −1. In every event quarter between −4 and +7, 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 that fundraise are significantly above their own average percentile rank for nine consecutive quarters from −3 to +5. Excess rank peaks in event quarter 0 at 6.0% for all VC fundraisers. For low (high) reputation fundraisers, the excess rank peaks in event quarter 0 at 8.1% (4.5%). Furthermore, in every event quarter between −3 and +3, low reputation GPs' excess rank exceeds that of high reputation GPs.[31]

6.3. Tests of the exit and fundraise and NAV management hypotheses

When we split the sample based on the realization status of the fund at the time of fundraising (last four columns of Table 5), we find that much, though not all, of the performance peaking that we observe can be traced to the high realization status of the funds. In general, GPs with high realization status at the time of fundraising have big improvements in their performance ranks at the time of fundraising (regardless of GP reputation). The same general pattern emerges for both BO and VC funds. This supports the notion that GPs tend to fundraise on the heels of a good exit. Because portfolio companies are generally booked conservatively, a good exit can dramatically improve interim performance, elevating 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.

We test for reliable differences in excess ranks for funds conditional on their GP reputation and realization status by examining three quarters leading up to the fundraising quarter. To set the stage, we find no reliable differences between high and low reputation GPs conditional on high realization status (Columns 3a versus 3c) in any of the three quarters, while we find significant differences between the other pairings of groups. Consistent with the exit and fundraise strategy (H2a) being the dominant strategy, high realization funds have reliably more positive excess ranks than low realization funds conditional on being high reputation in all three quarters (Column 3c versus 3d) for both BO and VC funds.

The exit and fundraise story is compelling, but it does not appear to be the only mechanism that yields performance peaking around fundraising events. For low reputation GPs with below median realizations (Column 3b) we still observe some performance peaking for both BO and VC funds. In striking contrast, we do not observe any performance peaking for high reputation GPs with low realizations, as it is less important to show strong interim performance. Consistent with the NAV management strategy

(H2b), low reputation GPs have reliably more positive excess ranks than high reputation GPs conditional on being low realizations in half of the quarters we test (Columns 3b versus 3d).

This inter-group variation in our peaking results, both on the reputation dimension and the realization dimension, is difficult to explain entirely with the exit and fundraise strategy and mean reversion alone and is consistent with the pursuit of the NAV management strategy (H2b) by a low reputation segment of GPs lacking meaningful exits (Column 3b).

6.3.1. NAV markdowns

Our prior results indicate that 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 more enthusiastic about the interim performance reported by a low reputation GP when the fund has strong exits to show. Moreover, the performance peaking that we find 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 positively respond to interim performance when assessing a follow-on fund even when the current fund has few realizations (see Tables 3 and 4). More important, we observe performance peaks for these low realization funds only for low reputation GPs. These results lend credibility to the SEC's concerns that GPs may upwardly manage valuations during fundraising periods, as undetected NAV management 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 show is a result of NAV management, 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, markdowns are larger in absolute value and more frequent in the post-fundraising period. For example, for VC funds, the average size of a markdown in the post-fundraising period is larger in absolute value (-$125.8, $p <$ 0.05) and the frequency of markdowns increase in this period (odds ratio of $1.13 = e^{0.122}$, $p < 0.05$). We observe similar, albeit statistically weaker, results for BO funds.[32]

Consistent with the notion that the incentives to manage NAVs are greatest for low reputation GPs, we tend to observe larger increases in the absolute size and frequency of markdowns for low reputation VC funds, though we do not observe a similar effect for BO funds.

In Columns 3a to 3d, we interact the key post-fundraising dummy variable with GP reputation and the realization status of the fund. We find that the overall neg-

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[31] The results in Table 6 are qualitatively similar if we estimate standard errors using observations clustered by calendar year.

[32] One potential 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, could lack power. The results in Table 7 are qualitatively similar when we estimate standard errors based on observations clustered by fundraising event.

Table 6

The size and frequency of markdowns in the post-fundraising period

  This table presents estimates of Tobit regressions of markdown size (Panel A for buyout (BO), panel C for venture capital (VC)) and logit regressions of markdown incidence (Panel B for BO, 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. 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. The buyout regressions are estimated using data for 9015 fund-quarters and 422 funds; the VC regressions are estimated using data for 10,143 fund-quarters and 440 funds. See Table 2 for descriptive statistics on cash flow variables. t-statistics are presented in parentheses. GP = general partner. *, **, and *** denote $p < 0.10$, $p < 0.05$, and $p < 0.01$, respectively.

	All funds (1)	Low reputation GPs (2a)	High reputation GPs (2b)	High realization Low reputation GPs (3a)	Low realization Low reputation GPs (3b)	High realization High reputation GPs (3c)	Low realization High reputation GPs (3d)
Panel A: Tobit regression, BO funds							
Post-fundraising	−64.91	−56.63	−70.16	28.86	−159.0**	−48.61	−89.00
	(−1.60)	(−0.99)	(−1.21)	(0.41)	(−2.11)	(−0.66)	(−1.26)
Panel B: Logit regression, BO funds							
Post-fundraising	0.0524	0.0727	0.0035	−0.0358	0.206*	0.0118	−0.0037
	(0.84)	(0.82)	(0.04)	(−0.33)	(1.75)	(0.10)	(−0.03)
Panel C: Tobit regression, VC funds							
Post-fundraising	−125.8**	−306.3***	66.51	−111.4	−384.4***	144.4	12.30
	(−2.24)	(−3.74)	(0.85)	(−0.84)	(−4.20)	(1.36)	(0.13)
Panel B: Logit regression, VC funds							
Post-fundraising	0.122**	0.269***	−0.0102	0.182	0.305***	−0.178*	0.117
	(2.27)	(3.41)	(−0.14)	(1.44)	(3.43)	(−1.75)	(1.29)

ative change in NAV markdowns in the post-fundraising period reported in Column 1 is entirely driven by the low reputation, low realization GPs for both VC and BO funds (Column 3b). Since this group experiences peaks in their excess percentile rank around fundraising (Table 5) but the peak is not accompanied by high rates of realizations, we interpret the evidence as indicative that these low reputation GPs with limited exits book their unexited investments more aggressively during fundraising to boost their interim performance. In contrast to the low reputation GPs, high reputation GPs with low realizations (Column 3d) neither experience performance peaks (Table 5) nor increase rates of markdowns post fundraising (Table 6). The contrast between the two groups is consistent with our initial finding from the hazard model that low reputation GPs have stronger incentives to show strong interim performance.

  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 reputation GPs that lack exits during the fundraising period. The empirical evidence suggests that low reputation GPs, specifically those with few exits, appear to upwardly manage NAVs during fundraising.

6.3.2. Post-fundraising performance

  We show that low reputation GPs with few realizations at the time of fundraising engage in more markdowns and larger markdowns following fundraising events. In this subsection, 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 of funds. 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 GPs upwardly manage fund NAVs during fundraising campaigns relative to other periods or other funds that are not fundraising, then fundraiser PVMs would be systematically lower than other, non-fundraising funds' PVMs following a fundraising event.

  The results of this analysis are presented in Table 7. Among all BO funds, the mean PVM of fundraisers is reliably less than non-fundraisers by −5.34 percentage points ($t = −1.76$). This effect is particularly pronounced for low reputation GPs, in which the mean PVM of fundraisers is −11.0 percentage points 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. We do not find reliable evidence of differences between the two subsamples.[33]

  In Columns 3a to 3d, we interact GP reputation 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 BO and VC funds (albeit with marginal statistical significance). These results can be explained by GPs that pursue an exit and fundraise strategy combined with generally conservative accounting. Given that these funds fundraised on the heels of strong exits, investing into these funds before the strong exits at conservatively reported NAVs would have yielded higher PVMs. However, the results for low realization funds (Columns 3b and 3d) yield negative coefficients only for the low

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

Table 7

Post-fundraising performance based on pseudo value multiple (PVM)

Each time there is a fundraising event among vintage year cohort funds, we calculate a PVM for each of the vintage year cohort funds assuming an investor purchased the fund at the stated net asset value (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 general partner (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 2a–2b are estimated as a single interactive model with separate *Fundraiser* coefficients for the two subsamples (low reputation GPs and high reputation GPs). The results in the Columns 3a–3d are analogously estimated as a single interactive models with separate coefficients for the four subsamples (based on both the reputation and realization status of the GP). All models include fund and event-vintage year fixed effects. *t*-statistics are presented in parentheses. BO=buyout. VC=venture capital. *, **, and *** denote $p < 0.10$, $p < 0.05$, and $p < 0.01$, respectively.

	All funds (1)	Low reputation GPs (2a)	High reputation GPs (2b)	High realization Low reputation GPs (3a)	Low realization Low reputation GPs (3b)	High realization High reputation GPs (3c)	Low realization High reputation GPs (3d)
Panel A: BO 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)
Number of 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)
Number of fundraising events X cohort funds	1934		1934			1934	

reputation GPs. The striking difference between Columns 3b and 3d is consistent with the performance peaking and NAV markdown results in Tables 5 and 6. Though the result is statistically significant only for the BO fund sample, we interpret these results as suggestive that low reputation, low realization GPs upwardly manage valuations at the time of the fundraising event.

The markdown and post-fundraising performance results do not necessarily imply that GPs mark valuations above cost during fundraising and then adjust them downward post-fundraising; GPs can upwardly manage NAVs by reporting the valuations of unsuccessful investments at par (when their true values are below cost) and defer their markdowns or write-offs until after the fundraising event. Similarly, given the fact that valuations in general are kept conservatively in private equity at normal times, aggressive booking relative to the general conservatism might or might not mean NAV is booked above the true value for individual investments during fundraising. Unfortunately, without individual portfolio company data, we are unable to explore this issue in more detail. What we do argue is that, relative to other funds that face less pressure, low reputation GPs with few exits appear to upwardly manage NAVs during fundraising and subsequently experience increased markdowns after fundraising and that this strategy appears to enhance their chance of successful fundraising.

We conjecture that the low reputation, low realization GPs that are the most likely to manipulate. If true, relative to other GPs, we expect that the follow-on funds raised by these GPs will experience subpar performance and that these GPs will have difficulty raising future funds. Our analysis focuses on GPs that currently manage fund n and are raising capital for fund $n+1$. To understand whether the low reputation, low realization GPs that successfully fundraise later disappoint LPs, we analyze whether their fund n and $n+1$ perform poorly relative to other GPs' funds and examine the rates at which these GPs are able

to raise fund $n+2$ relative to other GPs. The basic idea is that if low reputation, low realization GPs later disappoint LPs with poor final returns, their rates of fundraising success should be lower than other GPs. We do find that the low reputation, low realization GPs have lower rates of future fundraising success and the poorest performance for both funds n and $n+1$, but the result lacks statistical significance. The lack of significance could be due to the small sample size among the low reputation, low realization GPs (27 buyout funds and 30 VC funds), as we must restrict the analysis to GPs with fund $n+1$ raised in or before 2005 to allow for sufficient fundraising time for fund $n+2$.

7. 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 more than eight hundred funds raised between 1993 and 2009. Consistent with prior research (Chung, Sensoy, Stern, and Weisbach, 2012; Hochberg, Ljungqvist, and Vissing-Jorgensen 2014), 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 show that the effect of interim performance on fundraising ability is stronger for low reputation GPs (because investors more strongly update their priors about ability) and for interim performance backed by realizations (because interim results are easier to verify).

Consistent with the notion that GPs are good at timing their fundraising for a follow-on fund, the current fund's performance rank is at its peak when the GP is fundraising for a follow-on fund. These results are also generally stronger for low reputation GPs and when interim performance is backed by realizations.

We investigate two mechanisms that generate the performance peaks that we find, 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, performance peaks are greatest for funds with high realization rates at the time of fundraising. Second, low reputation GPs appear to upwardly manage valuations at the time of fundraising. Consistent with the NAV management story, we find evidence of performance peaking even among funds with low realization rates, but only for low reputation GPs. In additional analyses, we show that these low reputation GPs with low realization rates experience more frequent and larger markdowns post-fundraising. For BO (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 upwardly managed during fundraising periods, while also showing that this result is mostly confined to GPs with little accumulated reputation capital. GPs with established track records and strong reputations have little need to manage performance and potentially much reputation capital to lose by manipulating NAVs around fundraising events. However, low reputation GPs lacking a strong exit have little to lose and much to gain from managing valuations to secure funding.

Our results represent an equilibrium outcome during the past 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 in which inflated valuations around fundraising events are rare.

References

Arcot, S., Fluck, Z., Gaspar, J., Hege, U., 2014. Fund managers under pressure: rationale and determinants of secondary buyouts. Journal of Financial Economics 115, 102–135.

Braun, R., Schmidt, M., 2014. The limited partnership model in private equity: deal returns over a fund's life. http://ssrn.com/abstract=2411044.

Brown, G., Gredil, O., Kaplan, S., 2016. Do private equity funds manipulate reported returns. http://ssrn.com/abstract=2271690.

Boleslavsky, R., Carlin, B., Cotton, C., 2016. Bayesian exaggeration and the (mis)allocation of scarce resources. University of California, Los Angeles Unpublished working paper.

Chakraborty, I., Ewens, M., 2016. Managing performance signals through delay: Evidence from venture capital. http://ssrn.com/abstract=2494677.

Chung, J., Sensoy, B., Stern, L., Weisbach, M., 2012. Pay for performance from future fund flows: the case of private equity. Review of Financial Studies 25, 3259–3304.

Cochrane, J., 2005. The risk and return of venture capital. Journal of Financial Economics 75, 3–52.

Crain, N., 2016. Venture capital and career concerns. http://ssrn.com/abstract=2517640.

Degeorge, F., Martin, J., Phalippou, L., 2016. On secondary buyouts. Journal of Finance, Journal of Financial Economics 120, 124–145.

Gompers, P.A., 1996. Grandstanding in the venture capital industry. Journal of Financial Economics 42, 133–156.

Gompers, P., Lerner, J., 1997. Risk and reward in private equity investments: the challenge of performance assessment. Journal of Private Equity 1, 5–12.

Gompers, P., Lerner, J., 1998a. Venture capital distributions: short-run and long-run reactions. Journal of Finance 53, 2161–2183.

Gompers, P., Lerner, J., 1998b. What drives venture capital fundraising. Brookings Papers on Economic Activity: Macroeconomics 2 (1998), 149–192.

Harris, R., Jenkinson, T., Kaplan, S., Stucke, R., 2014. Has persistence persisted in private equity? Evidence from buyout and venture capital funds. http://ssrn.com/abstract=2304808.

Harris, R., Jenkinson, T., Kaplan, S., 2014. Private equity performance: what do we know? Journal of Finance 69, 1851–1882.

Hochberg, Y., Ljungqvist, A., Vissing-Jorgensen, A., 2014. Informational hold-up and performance persistence in venture capital. Review of Financial Studies 27, 102–152.

Hüther, N., 2016. Raising Funds on Performance: are Private Equity Returns too Good to be True. Duke Unversity, Durham, NC Unpublished working paper.

Jenkinson, T., Sousa, M., Stucke R., 2013. How fair are the valuations of private equity funds. http://ssrn.com/abstract=2229547.

Kaplan, S.N., Schoar, A., 2005. Private equity performance: returns, persistence, and capital flows. Journal of Finance 60, 1791–1823.

Korteweg, A., Nagel, S., 2016. Risk-adjusting the returns to venture capital. Journal of Finance 71, 1437–1470.

Korteweg, A., Sorensen, M., 2010. Risk and return characteristics of venture capital-backed entrepreneurial companies. Review of Financial Studies 23, 3738–3772.

Lerner, J., 1994. Venture capitalists and the decision to go public. Journal of Financial Economics 35, 293–316.

Ljungqvist, A., Richardson, M.P., Wolfenzon D., 2007. The investment behavior of buyout funds: theory and evidence. http://ssrn.com/abstract=972640.

Metrick, A., Yasuda, A., 2010a. The economics of private equity funds. Review of Financial Studies 23, 2303–2341.

Metrick, A., Yasuda, A., 2010b. Venture Capital and the Finance of Innovation. John Wiley & Sons.

Metrick, A., Yasuda, A., 2011. Venture capital and other private equity: a survey. European Financial Management 17, 619–654.

Phalippou, L., Gottschalg, O., 2009. The performance of private equity funds. Review of Financial Studies 22, 1747–1776.

Ritter, J., 2016. Initial public offerings: VC-backed IPO statistics through 2015. http://bear.warrington.ufl.edu/ritter.

Robinson, D., Sensoy, B., 2011. Cyclicality, performance measurement, and cash flow liquidity in private equity. http://www.nber.org/papers/w17428.

Sensoy, B., Wang, Y., Weisbach, M., 2014. Limited partner performance and the maturing of the private equity industry. Journal of Financial Economics 112, 320–343.

Sorensen, M., Jagannathan, R., 2014. The public market equivalent and private equity performance. http://ssrn.com/abstract=2347972.

Stucke, R., 2011. Updating history. http://ssrn.com/abstract=1967636.

Woodward, S., 2009. Measuring risk for venture capital and private equity portfolios. http://ssrn.com/abstract=1458050.