

# Paying for Performance in Private Equity: Evidence from Management Contracts

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## **Abstract**

This paper offers the first empirical analysis connecting the timing of general partner compensation to private equity fund performance. Using detailed information on limited partnership agreements (LPAs) between private equity limited and general partners, we find that “GP-friendly” contracts—agreements that pay general partners on a deal-by-deal basis instead of withholding carried interest until a benchmark return has been earned—are associated with higher returns, both gross and net of fees. While some of the performance difference stems from the sorting of better performing GPs to more GP-friendly contracts, we also present evidence that the contracts themselves change GP investment behavior.

# 1 Introduction

Limited partner agreements (LPAs), the contractual arrangements between general partners and their investors, are the central mechanisms that define the terms of general partner (GP) compensation in private equity. These contracts specify management fees, the carried interest earned when private equity investments are exited, as well as the precise timing conventions that govern *when* GPs get paid.<sup>1</sup> Litvak (2009) shows that the timing of carried interest payments is a major determinant of the present value of compensation that GPs receive. Her calculations indicate that standard shifts in timing induce changes in the net present value of compensation that are at least as large as observed shifts in management fees and carried interest percentages. Despite their importance, we have virtually no empirical evidence connecting variation in carry timing conventions to the cash flows that limited partners receive. As a result, the effects of this compensation practice remain shrouded in mystery.

The aim of this paper is to shed first light on this important aspect of private equity compensation. We use a hand-collected, proprietary dataset of management contracts and fund performance to detail compensation practices in venture capital and connect them to fund performance. Our goal is to establish stylized facts about the relation between performance and carry provisions and explore theoretical explanations for the patterns we observe.

Historically, LPAs have followed one of two approaches for paying carried interest to general partners. Deal-by-deal, or “American,” carry provisions are considered more GP-friendly: they allow the general partners to earn carried interest on each deal as it is exited. In contrast, whole-fund, or “European,” carry provisions are more LP-friendly. They require that the limited partner receive a return on their investment before GPs

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<sup>1</sup>Standard arrangements involve a 2-2.5% management fee, paid as some specified percentage of invested or committed capital, and a 20-25% carried interest in exited investments. See Robinson and Sensoy (2013), Metrick and Yasuda (2009) or Gompers and Lerner (1999) for more details.

receive any carried interest.

For example, consider a fund that has exited two investments, one at a large gain and one at a loss, so that the overall return on the two exits is zero. A deal-by-deal carried interest provision would allow the GP to earn carried interest on the strong exit even though the combined return on the two investments was zero. Because clawback provisions typically do not require the return of interest, and often do not cover the entire return of principle, the GP essentially receives an interest-free loan over that time period even if he has to return part or all of the capital he has received. In contrast, a GP facing “fund-as-a-whole” carried interest provisions would not yet be eligible to receive carried interest, because the fund as a whole had not yet earned a positive return. If, later in the funds life, its return exceed a contractually specified benchmark return, the GP on a fund-as-a-whole carry scheme would begin earning carried interest at that point.

Thus, fund-as-a-whole carried interest provisions superficially safeguard limited partners by ensuring that they receive a certain hurdle rate before general partners receive any compensation. As compensation practices have come under increasing scrutiny, many industry observers have argued that limited partner agreements should adopt a standard, LP-first, compensation structure (see ILPA, etc.). In light of these concerns, the simplest way to frame our analysis is by asking the question, “Are limited partners actually better off with LP-friendly contracts?”

Our first set of results speaks directly to this question. We find strong evidence that GP-friendly contracts are associated with better performance on both a gross- and net-of-fee basis. The public market equivalent (PME) is around 0.82 for fund-as-a-whole contracts but is over 1.24 for deal-by-deal contracts. This means that whole fund contracts destroy about 18 cents per dollar of NPV of invested capital, while deal-by-deal funds exceeded what one could have earned in public markets by about 24%.<sup>2</sup> In

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<sup>2</sup>The public market equivalent, or PME, expresses the return to a private equity investment in terms of its excess over a publicly investable benchmark, so that a PME of 1.1 implies that the PE fund

the same vein, the gross internal rate of return is approximately 14 percentage points higher among the set of deal-by-deal contracts.

These differences in gross performance are not fully absorbed by variation in other contract terms. While fees and carried interest percentages are typically higher for deal-by-deal funds, limited partners earn higher net returns in deal-by-deal funds than in funds with whole-fund carry provisions. Thus, the answer to the question that frames our analysis is a resounding no: limited partners are not, on average, better off with LP-friendly contracts.

Why are GP-friendly contracts better for limited partners? There are two possible explanations. The first is a selection argument: better-quality GPs, all else equal, may be able to extract better deal terms through superior bargaining power, and thus would be more likely to have GP-friendly contract terms in place. If industry convention limits the amount of variation in fees and carry, then GPs may not be able to fully capture the rents associated with their better performance. The second explanation centers around a treatment effect: the terms of the GP-friendly contract itself may induce the GP to expend greater effort or take greater risk in choosing the investments, effectively causing the GP to behave differently than they otherwise would.

In the second part of the paper, we develop an instrumental variables strategy to distinguish between these possible explanations. In hot markets, when the amount of LP dollars flowing into the sector is high relative to the number of GPs available to deploy those dollars, bargaining power shifts in favor of GPs. This implies that some GPs are able to set GP-friendly contract terms in hot markets when they would not otherwise be able to in cooler market conditions. Using relative performance measures with vintage year fixed effects removes the obvious link between hot markets and subsequent performance, and thus the hot market effect satisfies the exogeneity condition. Because limited partners choose on the basis of expected performance, this identifica-

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outperformed its benchmark by 10% over the life of the fund (typically around 10 years). See Kaplan and Schoar (2005) or Robinson and Sensoy (2013) for more details.

tion strategy is potentially threatened if many of the chosen investments were with GPs who would have commanded GP-friendly contracts in any market conditions. In this case, unobserved variation in *expected* performance would lead to a weak instruments problem among the sample of chosen contracts. To combat this, we use a two-sample IV framework (see Angrist and Krueger 1992) to estimate the treatment effect of market conditions on a sample of almost-chosen contracts—these agreements were good enough to pass through multiple rounds of due diligence, but were not ultimately chosen, and thus were more likely to be sensitive to the treatment effect associated with hot market conditions.

Our IV strategy indicates that only around one-third of the overall effect is attributable to the endogenous sorting of high quality GPs to GP-friendly contracts. Around two-thirds of the effect remains when we link performance to exogenous variation in contracts. This suggests that the contract itself induces the GP to behave differently than they might otherwise facing different contract conditions. To explore this in greater detail, the third part of our paper investigates differences in exit behavior based on whether contracts are GP- or LP-friendly. LP-friendly contracts coincide with a grandstanding effect first documented by Gompers (1996). Among these contracts, exits cluster early in the fund’s life, and then again later in the fund’s life. In comparison, GP-friendly exit times more closely match the expected evolution of the underlying asset valuations of the portfolio companies in question. Similarly, GPs in LP-friendly contracts undertake less risky investments than those in GP-friendly contracts. This points to the idea that LP-friendly contracts induce the tendency to play it safe and “put some points on the board.”

Although our work is the first to connect the timing of carry provisions to the investment performance, our work is related to a number of papers that analyze venture capital compensation structures. The closest is probably Litvak (2009), who establishes the importance of carry timing in a sample of contracts with no connected cash

flow data. Gompers and Lerner (1999a) and Metrick and Yasuda (2010) also analyze contracts without direct access to the detailed cash flows. Only the recent study by Robinson and Sensoy (2013) contains contract terms and cash flow data. While their data set is much larger than ours, they lack gross cash flow data, do not have access to the details of carry provisions in limited partnership agreements (LPAs) and contain no information on the portfolio companies that the GPs have invested in. Our sample size considerably smaller than Robinson and Sensoy (2012), but is comparable to the other studies that make use of hand-collected datasets of contracts.<sup>3</sup>

The remainder of the paper is organized as follows. Section 2 discusses the data, while Section 4 presents the main findings. In Section 5 we develop the instrumental variables specification. Section 6 discusses the differences induced by Section 7 concludes.

## 2 Data Description

The data in our study were provided to us by one of the largest international limited partners in the world on an anonymous and confidential basis. Although they are a large, global investor, we restrict attention to U.S. venture capital partnerships to narrow the scope of the investment strategies in question. For 85 venture capital funds raised between 1992 and 2005 we have detailed contract data obtained from the limited partnership agreements along with information on all 3,552 portfolio companies in which the venture capital funds (GPs) invested. Common examples of such portfolio companies are Google, Facebook and others.

Our data allow us to measure precisely the timing and size of all cash flows exchanged between each of the 85 funds and the 3,552 portfolio companies. Importantly, our

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<sup>3</sup>For example, Ljungqvist and Richardson (2003) investigate 19 funds, Litvak (2009) uses a hand-collected sample of 68 funds and 28 GPs, Kaplan, Sensoy and Strömberg (2009) investigate 50 venture investments in portfolio companies, and Metrick and Yasuda (2010) have access to 94 funds provided by a single investor.

Investor undertakes special efforts to gather gross cash flow data, since normally the GPs transmit any gains on their capital net of fees (see, e.g., Metrick and Yasuda 2010, Robinson and Sensoy 2011). In addition, we have access to other internal information collected by the Investor in the due diligence process including: industry and fund management experience, age of the venture capital company, number of previous funds, investment focus and objective of the fund.

In addition, we have LPAs from 102 funds which passed the final stages of due diligence, but in which our investor ultimately chose not to invest. In this uninvested sample we have detailed contract terms but no subsequent cash flow data.

## **2.1 Sample representativeness and basic summary statistics**

In this section we compare our sample to publicly available data collected by Thompson One and the other above mentioned studies in order to analyze the representativeness of our sample. In addition, we also briefly describe the three VC compensation elements established by Litvak (2009).

—Please see Table 1—

Table 1, Panel A reports characteristics of the fund and its general partners. The average first closing date in our data is December 2000, which is close to the comparable funds from the Thompson One database. However, we find that our sample consists of statistically and economically larger funds than the average from Thompson One. Partly, this is attributable to the fact that the large size of the Investor in question precluded them from investing in small funds. However, if compared to other recent studies with contract data, e.g., Litvak (2009) or Metrick and Yasuda (2010), we find that the size of our analyzed funds is similar (556 million USD vs. 401.7 million USD as in Litvak (2009) or 322 million USD as reported by Metrick and Yasuda (2010)). The

percentage of early stage focused funds with 56% is similar to the overall statistics in the Thompson One database (45%), but overall the sample tilts towards larger, more early stage funds than many industry datasets.

While the age of the venture capital firm included in our sample is comparable to the overall investment universe approximated by Thompson One, our GPs are on average larger in terms of their previous investment activity. To capture this we compute the size of previous funds operated by the same general partners as a fraction of the total investment activity in the sector over the previous ten years. The GPs in our sample have committed about four times as much capital as the average in Thompson One. They are more experienced by a number of other measures as well. They have raised 2.8 funds on average, in contrast to 1.7 funds in the Thompson One data.

Although researchers and especially practitioners highlight the tremendous importance of investment experience in the industry, to the best of our knowledge no study has direct access to all curriculum vitas and other detailed information of the investment team. In addition to the standard measures of GP experience, our detailed access to due diligence materials allows us to measure the average experience of all investment professionals in the fund at the time the diligence materials are circulating. This is important because a first-time *fund* may comprise GPs with a wealth of experience at previous *firms*; their experience is typically unobservable to the econometrician but would surely be observable to a limited partner potentially considering a capital commitment. This allows us to control for previously unobservable variation in experience in our regressions later. The average team has 11.5 years of previous work experience in the industry.

Panel B summarizes contract characteristics, and in particular provides a first glimpse at the key variables of interest in our study; namely, the rules surrounding timing of carried interest payments. Our sample includes 60 deal-by-deal agreements and 25 fund-as-a-whole agreements. Our contracts largely mirror conventional wisdom with regard to management fees and carried interest percentages. Our 20% carry percentage is in line



with previous studies (Gompers and Lerner 1999a, Metrick and Yasuda 2010, Robinson and Sensoy 2011), where virtually all funds employ a carry of 20%.

In terms of management fees, our data are similar to many previous studies. The majority (46 cases) uses a 2.5% fee. Furthermore, for 28% of our observations we observe some variation regarding changes in fee basis from committed capital to either managed capital or net asset value. While the change in fee basis is only moderate, a change in fee level is far more pronounced. In roughly two thirds of all cases the fee declines to a mean value of 2% (see also Robinson and Sensoy 2011).

## 2.2 Definitions and detailed summary statistics

Turning to our key variables of interest we distinguish between two distributions rules, i.e., GP-friendly deal-by-deal compensation with clawback and LP-friendly fund-as-a-whole compensation with clawback. From Table 1, 71% (60 of 85 total funds) are deal-by-deal.

—Please see Table 2—

Panel A of Table 2 classifies our 85 venture capital funds by age and size of the VC firms, while Panel B shows the breakdown of distribution rules based on fund characteristics. Although the distribution of compensation rules is relatively evenly distributed regarding the age of the venture capital funds, larger VC firms and large funds (Panel B), which are likely to have a successful track record, are capable of negotiating the GP-friendly compensation rule. In contrast, the stage of focus (i.e., early vs. later stage) does not seem to play a main role. These findings confirm basic economic intuition.

### 3 Carry Provisions and Average Performance

The summary statistics reported in Table 3 lay the foundation for our multivariate analysis by relating the distribution rules, years of relevant work experience and the vintage year of the VC fund to fund performance. A PME is calculated by discounting the actual cash outflows and cash inflows that the fund received with the returns earned on a publicly tradable index over the same time period and forming the ratio of the discounted cash inflows over the discounted outflows. In the spirit of the “tailored PMEs” of Robinson and Sensoy (2012), we calculate ours using the Russell 2000 index, however none of our results are dependent on the particular index used to calculate the PME.<sup>4</sup>

—Please see Table 3—

Table 3 shows that PMEs for funds with a fund-as-a-whole compensation are significantly below deal-by-deal funds. In gross-of-fee terms, whole fund contracts averaged a PME of 0.82 versus 1.241 for deal-by-deal; net-of-fees the PMEs were 0.967 for deal-by-deal versus 0.638. Performance is highly correlated with years of work experience and is significantly stronger in the 1992-1997 period.

Our data are rich enough to explore finer gradations in contract terms. In particular, we can distinguish between ‘strict deal-by-deal’, in which the GP is paid on a single deal basis getting paid after each single positive exit, and ‘deal-by-deal realized loss,’ which occurs when the GP is paid on a single deal basis but has to reimburse previous realized losses before earning carried interest. In addition, ‘basic fund-as-a-whole’ occurs when the GP receives no carry until LPs get distributions equal to contributed or invested capital, plus where applicable a preferred return. In contrast, ‘full fund back’ dummy

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<sup>4</sup>The choice of benchmark in the PME calculation can potentially affect the performance inferences one draws from the measure. Kaplan and Schoar (2005) use the S&P 500 index as a benchmark. Robinson and Sensoy (2011) also use the S&P 500 but extend their measure with “tailored” PMEs based on different indices being more in line with high growth, high risk characteristics of venture capital investments. In our analysis, we also use the Dow Jones Venture Capital index as a benchmark and also calculate the internal rate of return as an additional performance measure.

takes the value of one if the GP receives no carry until LPs get distributions equal to committed capital, plus where applicable a preferred return, and zero otherwise.

—Please see Table 4—

Table 4 shows that there is a monotonic relationship between fund performance and the GP-friendliness of the contract terms. Strict deal-by-deal contracts are associated with the best average performance; these contracts offer the friendliest terms for general partners because they allow the GP to earn carry regardless of what has happened in prior deals. The differences between the different type of deal-by-deal contracts are less pronounced than the difference between either deal-by-deal contract and the average whole fund contract.

Before we turn to the main results in the next section, Table 5 focuses on performance only explained by market cycles, GP and fund characteristics.

—Please see Table 5—

The adjusted  $R^2$  value in Model (1) indicates that vintage year fixed effects explain 13.7% of the total variation in PME's. Models (2) and (3) connect performance of the fund in question to the observed cash multiple of previous funds at the time of the fund-raising. (For first-time funds this is the average multiple of the last fund associated with each investment professional.) In Model (2) without vintage year fixed effects, we find no relation, consistent with Phallippou (2013). However, in Model (3) we add vintage year fixed effects to the past performance regression, and the adjusted  $R^2$  value rises to 16.3% and the loading on past performance becomes statistically significant.

Models (4) and (5) turn instead to the years of relevant work experience. The magnitude of the point estimate indicates that it would take more than ten years of work experience to erase the difference in the average performance between deal-by-deal and whole fund contracts.

Model (6) introduces both measures simultaneously. The fact that the explanatory power of the observed multiple jumps dramatically when we hold constant the work experience of the investment team suggests the limited partners have some ability to distinguish luck and skill. This result is the opposite of what Phalippou (2013) argues and indicates that controlling for information that would be available to limited partners but unobservable to the econometrician is critical for understanding persistence (see also Korteweg and Sorensen, 2014). Models (7) and (8) include additional controls. Controlling for fund size and the number of past funds adds little to the analysis.

In the remainder of the analysis, we use the variables in model (7) as baseline controls, as this specification has the highest adjusted  $R^2$  of any of the models in Table 4. Model (7) shows that the performance persistence result first documented by Kaplan and Schoar (2005) holds in our sample even when it is based on performance data available at the time the commitment is made.

## 4 Explaining differences in Average Performance

We begin in Panel A of Table 6 by exploring the relation between carry distribution rules and gross-of-fee performance. Overall, the results indicate that GP-friendly, i.e., deal-by-deal, compensation is associated with higher performance. The economics effects are also large, slightly below the magnitude as the difference in unconditional means reported in Table 2.

—Please see Table 6—

Column (1) omits vintage year fixed effects but includes the controls from Table 5, Model (7). In this specification the average performance difference in gross performance is 0.4, which is essentially equal to the raw performance difference reported in Table 2. In

Column (2) we introduce vintage year fixed effects and the magnitude of the distribution rule dummy drops to 0.32.

Columns (3) and (4) introduce management fees and carried interest. We find that higher fee funds deliver higher gross-of-fee performance, which is consistent with the net-of-fee evidence in Robinson and Sensoy (2013). Column (5) adds contract terms to the specification but omits vintage year fixed effects; this specification is comparable to Model (1) and indeed the point estimate of 0.397 illustrates that controlling for deal terms in the absence of vintage year fixed effects does little erase the main result. Although the limited amount of variation in the data gives us low power to identify the effect, the loading on carried interest in Model (5) says that VC funds that were able to command more than 20% carried interest under-performed after we control for other contract terms.

When we include vintage year fixed effects in Model (6), however, we see that the inclusion of fees and carry lowers the point estimate on the deal-by-deal dummy from 0.322 in Column (2) to 0.277. The fact that controlling for fees and carry has a larger impact on the deal-by-deal point estimate in the presence of vintage year fixed effects is a reflection of the fact that there is a great deal of time-series clustering of carry and fees, as illustrated in Robinson and Sensoy (2013). All told, the combined effect of vintage year fixed effects, observable GP characteristics and other contract terms erases around one-quarter of the overall performance difference associated with deal-by-deal carry provisions.

The results in Panel A do not allow us to know whether LPs are better off with GP-friendly provisions. They only indicate that GPs are better off with GP-friendly contracts. Panel B of Table 6 turns to the question of net-of-fee performance. This allows us to ask whether LPs also benefit from GP-friendly provisions.

We relate contract terms to net-of-fee performance using regression specifications that mirror those reported in Panel A. The results are qualitatively similar. In particular,

we find that net-of-fee returns are in between 22 to 36 percentage points higher for deal-by-deal distribution rules than fund-as-a-whole rules. In Panel A the analogous coefficients are 28 to 41. If the increased performance were purely captured by the GP, we would expect that there would be no difference in net-of-fee performance based on the distribution rule. In fact, pushing to the extreme, based on the evidence in the mutual fund industry, one might even expect deal-by-deal agreements to return *lower* net-of-fee performance if GPs were essentially able to overcharge for their quality.

In contrast, if the difference in performance owed strictly to induced incentives, and LPs were able to pin GPs down to their participation constraint, then we would expect the coefficients on net-of-fee performance to exactly equal those obtained for gross-of-fee performance. Instead, we see a result in the middle, indicating that the gains are shared between the two parties, with the bulk of the extra returns flowing directly to limited partners in the form of higher net-of-fee returns. Turning to management fees, Table 5 shows that performance is no longer significantly positively related to management fees, in contrast to the finding in Table 4. This result supports the finding that differences in bargaining power drive the relation between management fees and performance.

The comparison of gross and net of fee returns is important for several reasons. First, it helps us to distinguish explanations based on type-selection from explanations based on the incentive effects of the contract. If it were the case that GP-friendly provisions were purely a form of rent extraction, and that better quality GPs (or higher status GPs) were better able to bargain on their own behalf, then we would expect to see no results on net-of-fee returns. Instead the results suggests that contracts shape the behavior of GPs.

Figure 1 summarizes the results of this section. Blue columns on the left are gross-of-fee performance, red columns on the right are net-of-fee. The columns marked ‘Raw’ reflect the uncorrected differences from Table 3. ‘History’ summarizes column (1) of Table 6. The columns labeled “Vintage” adds vintage year fixed effects to the historical

performance controls. This corresponds to Column (2) of Table 6. Finally, “Contract” adds contract terms; this is Column (6) from Table 6. The table show that there are pronounced differences between deal-by-deal and whole fund contracts that persist even after controlling for vintage years, for contract terms, and for observable past performance. Moreover, much of this performance accrues to limited partners, it is not simply captured by general partners.

## 5 Do Contracts Change Behavior?

The results thus far merely point to a correlation between the timing of carried interest and fund performance. These correlations are silent on whether the results are attributable to constrained rent extraction by higher talent GPs or whether they reflect the fact that contracts affect outcomes by shaping incentives and behavior.

To take up this question, in this section we develop a two-sample instrumental variable strategy. Our approach is based on the idea that as market conditions change, the bargaining power between GPs and LPs changes. In times when the money flowing into the sector by LPs is highest relative to the availability of GPs to absorb new capital is greatest, GPs have the most bargaining power. In these situations some GPs might receive deal-by-deal compensation in hot market periods even when they might not have gotten the same contract terms in cooler market conditions.

Based on data by Thomson One and PitchBook, connecting LPs to GPs, we define a hot market dummy variable for periods between January, 1998 and March, 2000, inclusive. As we show in the appendix, this is the period in which the imbalance between new LP dollars entering the market and GPs available to receive their capital is greatest. Discussions with industry professionals also confirm that this period was one in which the pressure of new money coming into the sector was especially strong, tilting bargaining power in favor of general partners.

Of course, a hot market dummy itself would violate an exclusion restriction in a simple model without vintage year fixed effects; indeed, an abundance of previous work has shown that there is an industry flow/performance relation (Kaplan and Stromberg, 2009, Kaplan and Schoar 2005, Robinson and Sensoy, 2013). Therefore we include vintage year effects in the second stage. In addition, working with a relative performance measure like the PME as a dependent variable itself helps to alleviate these concerns, as the flow/performance relation is much stronger in absolute returns (Robinson and Sensoy, 2013).

The challenge is that we have to deal with the fact that our sample of VC funds is selected based on expected performance. Some funds with high expected performance can negotiate better terms irrespective of market conditions. If this is the case, then the sample of selected funds may be unaffected by the instrument, leading to a weak instruments problem.

Our solution to this problem is to use a two-sample IV approach, where we predict the distribution rule on a sample of funds that did not make it past the last due diligence round. Because these funds per se had lower expected performance, the hot market dummy is more likely to pick up variations in the distribution rule.

There are two critical assumptions required for the two sample IV approach to hold. One is that the two samples must be drawn from essentially the same population. In fact, the selected funds our investor chose were, ex post, no different from the sample of almost chosen funds in IRR terms.<sup>5</sup> A second is that the instrument affect both samples in the same way. Although this is more difficult to verify, it is important to stress that the funds for our first-stage passed through all stages of due diligence and simply were not committed.

Table 7 reports the results of the first and second stage.

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<sup>5</sup>Although we do not have cash flow data from the almost-chosen funds, our investor kept track of their ex post absolute performance.



—Please see Table 7—

The first two columns represent the estimation of a 2SLS IV regression based on the sample of committed funds. The hot market dummy is only marginally significant leading to biased/weak predictions, as seen in the second stage (column 2). Adding non-committed funds with contract terms information to the sample in order to estimate the first stage (column 3) improves the prediction of the distribution rule. Only focusing on the non-committed funds in the first stage leads to a smaller standard error for the distribution rule estimates in the second stage as shown in column (6).<sup>6</sup> The distribution rule dummy coefficient of 24.7% reveals that around two-thirds of overall fund performance differences in association with deal-by-deal carry result from treatment.

## 6 Direct evidence of behavioral differences

The previous sections demonstrate that GP-friendly contracts are associated with returns, both on a gross and net of fee basis, and that these return differences cannot be explained simply by pointing to differences in inherent GP quality. In this section we provide more direct evidence that contracts are associated with different types of investment. We proceed in two steps. First we examine how the timing of exits varies across contract types, then we examine differences in risk-taking and contract timing.

### 6.1 Exit timing

Figure 2 illustrates the timing of investment and exit decisions according to whether the fund follows a whole-fund or deal-by-deal carry scheme. The left column of figures depicts the distribution of investment times for the two types of contracts as a function of fund age. This is generated by pooling all initial investments by fund age for each

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<sup>6</sup>Calculations for asymptotically correct standard errors are based on Murphy and Topel (1985).

contract type and then plotting the distribution of investments. There is very little difference in the distribution of investment times: for both contract types the median investment occurs in about the 7th or 8th quarter of the funds' existence, meaning that funds have made about half of their initial investments by the beginning of their third year of existence.

Unlike with investment times, there are substantial differences in the distribution of exit times by contract type, as can be seen by the two graphs in the right column of Figure 2. For deal-by-deal funds, the mean exit occurs in around the 29th quarter, while for whole fund the mean occurs in about the 33rd quarter. These differences in means and medians mask substantial variation in the overall distribution, however. Deal-by-deal distribution times follow the evolution of net asset values that one would obtain by using the parameters in Metrick and Yasuda (2010) and forecasting the evolution of NAVs.<sup>7</sup> This is consistent with the idea that managers under deal-by-deal contracts are acting under an incentive to maximize the value of each exit irrespective of how it is connected to the broader portfolio they manage.

In contrast, whole-fund contracts are associated with a first spike in distributions between the 16th and 18th quarter of the fund's life, and a later spike around the 40th quarter of age. The first spike coincides roughly with the end of the funds' investment period, and hence the need to raise a follow-on fund. This is related to findings in a series of papers (see Barber and Yasuda (2014), Brown, Odel and Kaplan (2014) and Jenkinson, Sousa and Stucke (2014)) connecting the timing of fund-raising decisions to revisions in the stated net asset values of the underlying assets under management of the GP: it suggests that whole fund contracts operate under an increased incentive to grandstand, posting early returns to investors in order to send a signal of the fund's underlying quality.

—Please see Table 8—

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<sup>7</sup>Calculations based on simulations are available from the authors on request.

Table 8 examines this in greater detail with hazard rate models that model the hazard of exiting a portfolio company investment as a function of the carry provisions. Columns (1) and (2) report multiple observations per failure specifications using the entire data set. Hazard impact factors are reported. The coefficients on deal-by-deal carry provisions indicate that relative to whole fund carry provisions, deal-by-deal contracts are associated with quicker exit times. LPAs with higher GP carried interest percentages are associated with longer holding times, as are funds with higher observed prior multiples. Funds with more experienced management teams hold their investments shorter.

## 6.2 Market timing and risk-taking

The evidence in Figure 2 suggests that one source of increased value in deal-by-deal contracts is that general partners facing these contracts have a reduced incentive to exit early in order to signal their quality to investors. To explore exit timing in more detail, Figure 3 examines how the exit times line up with broader market conditions.

In the left column of Figure 3 we sort fund quarters not chronologically but instead by contemporaneous market returns over that quarter. Towards the left are quarters associated with low market returns; towards the right market returns improve. Then we plot the distribution of exits as a function of these underlying market conditions along the vertical axes. This allows us to plot the gross PME realized on each exit as a function of the market conditions when the exit occurred.

The blue line in the top portion of the left column shows PMEs for deal-by-deal funds; the fact that it is almost always above the red line (for whole-fund) indicates that in most market conditions deal-by-deal funds outperform whole funds by a small margin. But this margin grows substantially in the quarters with the very strongest market returns. This indicates that a big source of the overall difference between whole-fund and deal-by-deal funds stems from the ability of deal-by-deal funds to generate

large exits in strong market conditions.

The final piece of behavioral evidence appears in the right column of Figure 3. Here we use the method described in Ljungqvist, Richardson and Wolfenzon (2007) to compute the volatility of venture capital investments at the portfolio company level. This allows us to plot the evolution of risk-taking over the fund’s life as a function of whether it is associated with whole-fund or deal-by-deal carry. The difference in fund structures is striking. Whole fund contracts are associated with less risk-taking upfront, but their risk-taking spikes as the fund’s age grows. In contrast, deal-by-deal contracts are more uniformly concentrated in higher risk investments throughout the fund’s life.

## 7 Conclusion

Private equity compensation practices have come under increasing scrutiny in recent years. Many practitioners, academics and industry observers have called for broad changes in the way that general partners are compensated, placing special emphasis on the timing of when LPs and GPs receive their carried interest compensation. Indeed, the Institutional Limited Partners Association (ILPA) argues that “A standard all-contributions-plus-preferred-return-back-first model must be recognized as a best practice” (ILPA, 2011).

Suggestions such as this are of course predicated on the implicit assumption that these LP-friendly terms and conditions are in fact good for limited partners. This ignores two possible roles that contracts may play. One is that contracts effect incentives—that altering the compensation structure that GPs face will in turn alter their behavior. The second is that contracts signal quality—that GPs and LPs can use the heterogeneity in the friendliness of compensation provisions as a way of allowing GPs of imperfectly observed quality to signal their ability.

This paper uses hand-collected, proprietary data connecting the terms of private equity management contracts to investment outcomes to show that GP-friendly contracts are associated with higher performance, both for the general partners as well as the limited partners. In other words, we find better investment performance for limited partners among the set of deals supported by GP-friendly contracts than among the set of deals supported by LP-friendly contracts. This finding is directly at odds with the oft-stated view that overly friendly management contracts destroy value for limited partners. If anything, the opposite is true.

We, of course, urge caution in interpreting this result. The ultimate thought experiment would be to randomly assign contracts to GPs and compare performance across GP-friendly and LP-friendly contracts. No such random assignment occurs in reality. Thus, one reason for these findings is that the presence of GP-friendly terms is endogenous to the characteristics and past experience of the general partner. Better general partners command better compensation on average.

Our analysis suggests that this is far from the whole story. Indeed, our instrumental variables estimation suggests that around 1/3 of the effect is due to sorting based on quality, with the remainder owing to the effect that contracts have on behavior. The terms of the contract appear to cause general partners to behave differently than they would have otherwise. GPs operating funds under LP-friendly contracts appear to begin by generating early exits in relatively less risky deals. This suggests they have a motive to “put points on the board, ” consistent with the classic “grandstanding” results of Gompers (1996).

There are a number of potentially competing mechanisms behind this finding. One is that the whole-fund provisions induce general partners to exit investments early so that they can begin earning carried interest. The idea is that early in the fund’s life they wish to return invested capital as quickly as possible so that they can begin earning carried interest. If this is at work then the LP-first compensation structure appears to

undermine the LPs performance, as it induces GPs to exit early.

A second potential mechanism is more subtle and is based on a signaling argument. The idea here is that if market participants know that the pool of whole-fund contracts contains low quality GPs as well as high quality, but unproven, GPs, then general partners may use early exits as an attempt to signal their quality. (This is closer in line with the spirit of the classic grandstanding result of Gompers, 1999). If this is the primary mechanism behind the early exit, then abolishing deal-by-deal carried interest, as suggested ILPA and other industry observers, would cause known high quality GPs to pool with everyone else, and the lack of an alternative available contract would presumably undermine the incentive to exit early. We cannot differentiate between these possibilities, but both appear to be bad for limited partners on average.

Of course, because we cannot distinguish between these explanations, we cannot conclude that observers are wrong to call for change in private equity compensation practice. Grandstanding considerations might be mitigated by pooling all general partners into common contractual structures. Alternatively, the pooling might exacerbate the tendency for early exits if it is driven by the desire for the GP to cross the carry waterfall as quickly as possible. Thus, if anything, this paper shows that policy makers should proceed with great care when making changes to the contractual environment of private equity investment. Policy stances that would seem superficially to be desirable for limited partners are not obviously better. They can easily generate the opposite effect for limited partners and their constituent investors. Our results suggest that venture investors get what they pay for, at least on average.

## References

- [1] Angrist, J. D. and Krueger, A. B., 1992, The effects of age at school entry on educational attainment: An application of instrumental variables with moments from two samples, *Journal of the American Statistical Association*, 87, 328-336.
- [2] Axelson, U., Strömberg, P. and Weisbach, M. S., 2009, Why are buyouts levered? The financial structure of private equity funds, *Journal of Finance*, 64, 1549-1582.
- [3] Cameron, A. C. and Trivedi, P. K., 2005, *Microeconometrics—Methods and Applications*, Cambridge University Press.
- [4] Cochrane, J. H., 2005, The risk and return of venture capital, *Journal of Financial Economics*, 75, 3-52.
- [5] Conner, A., 2005, The economic value of terms and conditions: What is worth fighting for?, *Journal of Private Equity*, 8, 64-72.
- [6] Cumming, D., 2005, Capital Structure in Venture Finance, *Journal of Corporate Finance*, 11, 550-585.
- [7] Cumming, D., Fleming, G. and Suchard, J.-A., 2005, Venture capitalist value-added activities, fundraising and drawdowns, *Journal of Banking and Finance*, 29, 295-331.
- [8] Cumming, D., 2008, Contracts and Exits in Venture Capital Finance, *Review of Financial Studies*, 21, 1947-1982.
- [9] Cumming, D. and Johan, S., 2009, Legality and venture capital fund manager compensation, *Venture Capital*, 11, 23-54.
- [10] Cumming D. and Walz U., 2010, Private equity returns and disclosure around the world, *Journal of International Business Studies*, 2010, 41, 727-754.

- [11] Dow Jones, 2003, Dow Jones Private equity partnership terms and conditions, Dow Jones and Company, New York.
- [12] Dow Jones, 2006, Short-term gains, long-term pain, Private Equity News, 05/22/2006.
- [13] Dow Jones, 2007, Dow Jones Private equity partnership terms and conditions, Dow Jones and Company, New York.
- [14] Dow Jones, 2009, Dow Jones Private equity partnership terms and conditions, Dow Jones and Company, New York.
- [15] Dow Jones, 2010, Iipa to reveal revamped investor terms by year end, Dow Jones Newswires, 11/30/2010.
- [16] Dow Jones, 2011, Dow Jones Private equity partnership terms and conditions, Dow Jones and Company, New York.
- [17] Driessen, J., Lin, T.-C., and Phalippou, L., 2011, A New Method to Estimate Risk and Return of Non-traded Assets from Cash Flows: The Case of Private Equity Funds, *Journal of Financial and Quantitative Analysis*, Forthcoming.
- [18] Gompers P., 1996, Grantstanding in the venture capital industry, *Journal of Financial Economics*, 42, 133-156.
- [19] Gompers, P. and Lerner, J., 1996, The use of covenants: An empirical analysis of venture partnership agreements, *Journal of Law and Economics*, 39, 463-498.
- [20] Gompers, P. and Lerner, J., 1999a, An analysis of compensation in the U.S. venture capital partnership, *Journal of Financial Economics*, 51, 3-44.
- [21] Gompers, P. and Lerner, J., 1999b, *The venture capital cycle*, Cambridge, MA: MIT Press.



- [22] Heckman, J., 1979. Sample selection bias as a specification error, *Econometrica*, 47, 153-161.
- [23] Hüther, N., 2012. Heterogeneity in portfolio investments and the effect on management compensation, Unpublished Working Paper, December 2012.
- [24] Kaplan, S. N., and P. Strömberg, 2004, Characteristics, Contracts, and Actions: Evidence from Venture Capital Analyses, *Journal of Finance*, 59, 2173-206.
- [25] Korteweg, A. and Sorensen, M., 2010, Risk and Return Characteristics of Venture Capital-Backed Entrepreneurial Companies, *Review of Financial Studies*, 23, 3738 - 3772.
- [26] Lerner, J., Schoar, A. and Wongsunwai, W., 2007, Smart Institutions, Foolish Choices: The Limited Partner Performance Puzzle, *Journal of Finance*, 62, 731-64.
- [27] Li, K. and Prabhala, N. R., 2007, Self-Selection Models in Corporate Finance, *Handbook of Corporate Finance: Empirical Corporate Finance*, Vol. I, ed. B. E. Eckbo, in: North Holland Hand-books in Finance, Elsevier Science B.V., Chapter 2, 37-86.
- [28] Litvak, K., 2009, Venture capital limited partnership agreements: Understanding compensation arrangements, *University of Chicago Law Review*, 76, 161-218.
- [29] Ljungqvist, A. and Richardson, M., 2003, The investment behavior of private equity fund man-agers, RICAFAE Working Paper, No. 005.
- [30] Long, A., 1999, Inferring period variability of private market returns as measured by from the range of value (wealth) outcomes over time. *Journal of Private Equity*, 5, 63-96.
- [31] Meyer, T. and Mathonet, P.-Y., 2007, J-curve exposure, John Wiley and Sons, Chichester.

- [32] Metrick, A. and Yasuda, A., 2010, The economics of private equity funds, *Review of Financial Studies*, 23, 2303-2341.
- [33] Metrick, A. and Yasuda, A., 2011, Venture Capital and other Private Equity: A Survey, *European Financial Management*, 17, 619-654.
- [34] Murphy, K. M. and Topel, R. H., 1984, Estimation and Inference in Two-Step Econometric Models, *Journal of Business and Economic Statistics*, 3, 370-379.
- [35] Phalippou, L., 2010a, Risk and Return of Private Equity: An overview of data, methods and results in: *Companion to Private Equity* ed. D. Cumming, John Wiley and Sons, Chapter 12.
- [36] Phalippou, L., 2010b, Venture capital funds: Flow-performance relationship and performance persistence, *Journal of Banking and Finance*, 34, 568-577.
- [37] Phalippou, L. and Gottschalg, O., 2009, The performance of private equity funds, *Review of Financial Studies*, 22, 1747-1776.
- [38] Petersen, M. A., 2009, Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches, *Review of Financial Studies*, 22, 435-480.
- [39] Robinson, T. D., and Sensoy, B. A., 2011. Do Private Equity Fund Managers Earn their Fees? Compensation, Ownership, and Cash Flow Performance, Working Paper, Ohio State, 1-40.
- [40] Woodward, S. E., 2004, Measuring risk and performance for private equity, mimeo, Sand Hill Econometrics.
- [41] Wooldridge, J. M., 2002, *Econometric Analysis of Cross Section and Panel Data*, The MIT Press, Cambridge, Massachusetts.

Table 1: Sample representativeness and GP compensation terms

This table shows sample representativeness by comparing our dataset to partnerships from Thomson One in Panel A and B. In addition we show descriptive statistics our sample on carry interest terms and management fees (see Metrick and Yasuda 2010) in Panel C, D and E. For Panel A and B we employ funds whose first closing was between January 1992 and December 2005. We use Thomson One’s Fund Statistics Report with the report date of March 31, 2012. Panel A shows fund data as follows: “First closing” denotes the mean first date of closing, while “Size” denotes the fund’s committed capital in million USD; “Early stage focus” is an indicator variable which takes the value of one, if fund stage is classified as seed or early and zero for balanced and later. VC Company Size expresses the size of the company in questions (across all it’s previous funds) as a fraction of the total capital it raised relative to the total amount raised by all venture organizations (i.e., investors’ commitments) over the ten years preceding each fund. VC Company Age shows the age of venture capital company, i.e., the time of the closing of the first partnership that the venture capital organization raised to the closing of this fund. The variable “# of past funds” gives the number of past funds of the VCC, and “years of rel. work experience” denotes the average number of years the principal fund managers spend in positions in venture, private equity management and finance as measured by the Investor. The third column in Panel A presents the p-values of t-tests and Pearson  $\chi^2$ -tests (in round brackets) of the null hypotheses that the moments of these distributions are identical. (Unreported median results are qualitatively the same).

Panel B contains summary statistics on contract terms. “Carry level” is the level of carried interest as the percentage of the fund’s profit. “Initial fee level” is the level of annual management fees as the percentage of the fund’s committed capital at the beginning of the fund’s life. “% of funds changing fee basis after investment period” is the proportion of funds that changes its fee basis from committed capital to net invested capital after the completion of the investment period (which is typically five years for a ten-year fund). “% of funds changing fee level after investment period” is the proportion of funds that changes its fee level from its initial fee level after the completion of the investment period. “% of funds changing both basis and level” is the proportion of funds that changes both its fee basis and fee level after the investment period.

	Our sample: Cash-flow data with LPAs	Mean in Thompson One excluding our sample	P-values testing for diff. between our sample and Thompson One
<b>Panel A: Fund and Company data</b>			
First closing	December 2000	September 2000	0.006
Size (m USD)	556.004	85.404	0.000
Early stage focus	56%	45%	(0.042)
VC Company Size (% of Industry \$)	0.589%	0.144%	0.000
VC Company Age (in years)	10.29	9.01	0.106
# of past funds	2.81	1.71	0.001
Years of rel. work experience	11.55	-	-
<b>Panel B: Contract Characteristics</b>			
<u>Carry timing:</u>			
# of funds with deal-by-deal carried interest			60
# of funds with whole-fund carried interest			25
<u>Carried Interest:</u>			
# of funds with carry percentage > 25%			4
# of funds with 20% < carry percentage ≤ 25%			40
# of funds with carry percentage = 20%			40
# of funds with carry percentage < 20%			1
<u>Management Fees:</u>			
# of funds with initial fee level equal to 2.5%			46
# of funds with initial fee level equal to 2%			24
# of funds with initial fee level less than 2%			15
<u>Fee Timing:</u>			
% of funds changing fee basis after investment period			28.2%
% of funds changing fee level after investment period			67.1%
% of funds changing both basis and level			8.2%

Table 2: General partner, fund characteristics and fund performance

This table presents the number of all distribution rules of the 85 sample Limited partnership agreements for several GPs (panel A) and fund characteristics (panel B). Panel C reports the mean, median in percent and standard deviation of the public market equivalent (PME) based on Russell 2000. The age of venture capital organization refers to the time of the closing of the first partnership that the venture capital organization raised to the closing of this fund. The size of venture capital organization is the ratio of the capital invested in the organizations funds, in USD, whose first closing was in the ten calendar years prior to the year that this fund closed, to the total amount raised by all venture organizations (i.e., investors' commitments) in these years, again in USD. Early stage focus is a dummy variable which takes the value of one, if fund stage is classified as seed or early and zero for balanced and later. "Fund size" is the total capital committed to the venture fund, specified in the partnership agreement. The years of relevant work experience denotes the average number of years the principal fund managers have spent in positions in venture, private equity management and finance as measured by the Investor. "First closing" denotes date of fund's first closing (e.g., January 1, 1995 coded as 1995,0). The PME is calculated by discounting the actual cash outflows and cash inflows of the fund with the returns on the Russell 2000 over the same time period and forming the ratio of the discounted cash inflows over the discounted outflows.

	deal-by-deal	whole-fund
<b>Panel A: GP characteristics by distribution method</b>		
Age venture capital organization		
5 years or less	28	10
Between 5 and 15 years	13	9
More than 15 years	19	6
Size of venture capital organization		
No earlier funds	11	5
Between 0% and 0.5%	29	15
Greater than 0.5%	20	5
<b>Panel B: Fund characteristics by distribution method</b>		
Stage focus		
Early stage focus	26	13
Other stage focus	34	12
Fund size		
\$100m or less	8	6
Between \$100m and \$500m	29	14
Greater than \$500m	23	5

Table 3: VC Fund Performance and Distribution Rules: Raw results

This table reports the mean, median in percent and standard deviation of the public market equivalent (PME) based on Russell 2000. The years of relevant work experience denotes the average number of years the principal fund managers have spent in positions in venture, private equity management and finance as measured by the Investor. “First closing” denotes date of fund’s first closing. The PME is calculated by discounting the actual cash outflows and cash inflows of the fund with the returns on the Russell 2000 over the same time period and forming the ratio of the discounted cash inflows over the discounted outflows.

Fund returns gross / net cash flow based		
	Gross PME mean/median [s.d.]	Net PME mean/median [s.d.]
Distribution rule		
deal-by-deal	1.241/1.051 [0.580]	0.967/0.860 [0.520]
full fund back	0.833/0.702 [0.492]	0.638/0.509 [0.472]
Years of relevant work exp.		
6 years or less	0.841/0.676 [0.526]	0.557/0.511 [0.267]
Between 6 and 10 years	1.035/0.998 [0.610]	0.828/0.759 [0.589]
Greater than 10 years	1.226/1.137 [0.562]	0.962/0.902 [0.506]
Vint. year/first closing		
Jan '92 - Dec '97	1.794/1.475 [1.094]	1.628/1.296 [1.019]
Jan '97 - Dec '99	1.220/1.076 [0.499]	1.071/1.007 [0.506]
Jan '00 - Dec '01	1.025/0.998 [0.542]	0.721/0.761 [0.419]
Jan '02 - Dec '05	1.166/1.050 [0.317]	0.963/0.850 [0.271]

Table 4: Fund performance and Distribution Rules: closer refinements

This table presents raw (mean) fund PME's broken out by closer refinements of the distribution rule. 'Strict deal-by-deal' dummy takes the value of one if the GP is paid on a single deal basis getting paid after each single positive exit, and zero if the GP is paid on a fund as a whole basis or on deal by deal realized loss basis; 'deal-by-deal realized loss' dummy takes the value of one if the GP is paid on a single deal basis but has to reimburse previous realized losses, and zero if the GP is paid on a fund as a whole basis; 'basic fund-as-a-whole' dummy takes the value of one if the GP receives no carry until LPs get distributions equal to contributed or invested capital, plus where applicable a preferred return, and zero if the GP is paid on a deal by deal basis. 'Full fund back' equals the value of one if the GP receives no carry until LPs get distributions equal to committed capital, plus where applicable a preferred return, and zero otherwise.

	Raw gross PME	p-value ttest	Raw net PME	p-value ttest
Strict deal-by-deal (GP-friendly:1)	1.267		1.003	
Otherwise (GP-friendly:2 - 4)	1.032	0.074	0.794	0.078
Deal-by-deal real loss (GP-friendly:2)	1.204		0.929	
Otherwise (GP-friendly:3,4)	0.833	0.017	0.638	0.042
Basic fund-as-a-whole (GP-friendly:3)	0.870		0.646	
Otherwise (GP-friendly:1,2)	1.237	0.018	0.967	0.021
Full fund back (GP-friendly:4)	0.737		0.619	
Otherwise (GP-friendly:1 - 3)	1.152	0.071	0.893	0.189

Table 5: Explaining gross fund returns

This table presents ordinary least squares (OLS) regression estimates of the determinants of VC fund performance gross of carried interest and fees in 85 U.S. venture capital partnerships. The dependent variable is the Russell 2000 Public Market Equivalent (PME), calculated by discounting the actual cash outflows and cash inflows that the fund received with the returns on the Russell 2000 over the same time period and forming the ratio of the discounted cash inflows over the discounted outflows. “Years of relevant work experience” denotes the average number of years the principal fund managers have spend in positions in venture, private equity management and finance as measured by the Investor. Observed Prior Multiple denotes the previous fund’s gross multiple, before carried interest and fee payments, at the time of the fund commitment. “Fund size” denotes the fund’s committed capital in million USD. ‘#\_past\_funds’ is the number of previously raised funds. One/ two/ three asterisks represent two-tailed significance at a 10%/ 5%/1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Yrs. rel. work exp.				0.028** (0.012)	0.031** (0.015)	0.037** (0.015)	0.036** (0.015)	0.035** (0.015)
Observed Prior Multiple		0.049 (0.044)	0.086* (0.049)			0.122** (0.050)	0.118** (0.055)	0.123** (0.056)
Log(fund size)							1.397 (1.941)	2.093 (1.948)
Log(fund size) <sup>2</sup>							-0.064 (0.117)	-0.110 (0.119)
#_past_funds								0.022 (0.021)
Vintage year FE?	yes	no	yes	no	yes	yes	yes	yes
Observations	85	85	85	85	85	85	85	85
Adjusted R-squared	0.137	0.000	0.163	0.062	0.211	0.272	0.311	0.309

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 6: Distribution rules and fund performance

This table presents OLS regression estimates of VC fund performance. The dependent variable is the Russell 2000 PME. Deal-by-deal is a dummy that takes the value of one if a deal-by-deal structure is agreed, and zero otherwise. The variable PV mgmt. fee is calculated ex post based on actual fee payments, discounted at 5%. Years of relevant work experience denotes the average number of years the principal fund managers have spend in positions in venture, private equity management and finance as measured by the Investor. Observed Prior Multiple denotes the previous fund's gross multiple, before carried interest and fee payments, at the time of the fund commitment. Fund size is fund committed capital in millions of USD. Standard errors are heteroscedasticity robust. One/ two/ three asterisks represent two-tailed significance at a 10%/ 5%/1% level, respectively. 85 observations, one per VC fund. Panel A reports PMEs before fees and carry, while Panel B reports net of fee performance.

Panel A: Gross-of-fee performance						
	(1)	(2)	(3)	(4)	(5)	(6)
Deal-by-deal	0.406*** (0.137)	0.322*** (0.113)			0.397*** (0.129)	0.277** (0.111)
PV mgmt. fee			0.049** (0.023)		0.039* (0.023)	0.043* (0.025)
Carried Interest				1.575 (2.580)	-2.739 (2.329)	-0.529 (2.325)
Yrs. rel. work exp.	0.033*** (0.012)	0.040*** (0.015)	0.031** (0.015)	0.035** (0.016)	0.032*** (0.011)	0.036** (0.015)
Observed Prior Multiple	0.046 (0.050)	0.099* (0.054)	0.123** (0.056)	0.116** (0.054)	0.055 (0.052)	0.107* (0.057)
Log(fund size)	1.439 (2.717)	2.161 (1.796)	0.531 (2.234)	1.952 (2.047)	-0.120 (3.268)	1.110 (2.086)
Log(fund size) <sup>2</sup>	-0.086 (0.162)	-0.114 (0.109)	-0.012 (0.134)	-0.098 (0.125)	0.011 (0.194)	-0.050 (0.127)
Vintage year FE?	no	yes	yes	yes	no	yes
Adjusted R-squared	0.152	0.361	0.359	0.306	0.166	0.384
Panel B: Net-of-fee performance						
	(1)	(2)	(3)	(4)	(5)	(6)
Deal-by-deal	0.357*** (0.134)	0.252** (0.095)			0.359*** (0.128)	0.219** (0.100)
PV mgmt. fee			0.035* (0.021)		0.028 (0.022)	0.029 (0.022)
Carried Interest				1.552 (2.084)	-2.981 (2.122)	0.057 (1.847)
Yrs. rel. work exp.	0.029*** (0.010)	0.034*** (0.012)	0.027** (0.012)	0.029** (0.013)	0.028*** (0.010)	0.031** (0.012)
Observed Prior Multiple	0.003 (0.029)	0.054** (0.026)	0.072** (0.030)	0.066** (0.028)	0.012 (0.031)	0.059** (0.029)
Log(fund size)	0.713 (2.392)	1.247 (1.509)	0.027 (1.759)	1.195 (1.723)	-0.728 (2.796)	0.675 (1.663)
Log(fund size) <sup>2</sup>	-0.044 (0.143)	-0.057 (0.092)	0.019 (0.106)	-0.052 (0.106)	0.046 (0.166)	-0.023 (0.102)
Vintage year FE?	no	yes	yes	yes	no	yes
Adjusted R-squared	0.117	0.426	0.417	0.386	0.126	0.434



Table 7: IV / TSIV regressions of distribution rule and gross fund return

This table presents IV (columns 1 and 2) and TSIV estimates (columns 3 - 6). The variable “distribution rule dummy” is instrumented with a hot market dummy that equals one for the quarters between Q4 1998 and Q1 2000. All other variables are estimated and defined as described in previous tables. Calculations for asymptotically correct standard errors are based on Murphy and Topel (1985). One/ two/ three asterisks represent two-tailed significance at a 10%/ 5%/ 1%.

	IV regression		Two Sample IV Regressions			
	(cc) 1 <sup>st</sup> step	(cc) 2 <sup>nd</sup> step	(cc & nc) 1 <sup>st</sup> step	(cc) 2 <sup>nd</sup> step	(nc only) 1 <sup>st</sup> step	(cc) 2 <sup>nd</sup> step
	D-by-d (1)	PME (2)	D-by-d (3)	PME (4)	D-by-d (5)	PME (6)
Hot Market dummy	0.188* (0.096)		1.143*** (0.234)		1.522*** (0.328)	
Deal-by-deal		-0.069 (0.316)		0.329** (0.142)		0.247** (0.107)
Yrs. rel. work exp.	-0.005 (0.012)	0.030** (0.013)	0.015 (0.020)	0.038*** (0.010)	0.043* (0.024)	0.032*** (0.010)
Observed Prior Multiple	0.039 (0.030)	0.073 (0.053)	0.121 (0.077)	0.080* (0.047)	0.057 (0.107)	0.106** (0.045)
Log(fund size)	-0.017 (1.987)	1.206 (2.783)	-2.516 (4.556)	2.738 (2.755)	-1.243 (5.815)	2.217 (2.717)
Log(fund size) <sup>2</sup>	0.017 (0.118)	-0.065 (0.166)	0.202 (0.276)	-0.161 (0.166)	0.111 (0.359)	-0.122 (0.162)
Constant	-0.463 (8.335)	-4.843 (11.692)	6.423 (18.821)	-11.232 (11.485)	1.681 (23.668)	-9.532 (11.384)
Vintage year FE?	no	yes	no	yes	no	yes
Observations	85	85	187	85	102	85
Pseudo R-squared	0.085		0.179		0.221	

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 8: Fund investment exit times for strict DD (GP-friendly:1) vs. WF (GP-friendly: 3 + 4)

This table presents hazard ratios associated with the GP's decision to sell/hold portfolio investments unregarding outcome and at loss/gain. We estimate Cox proportional hazards models. Hazard ratios can easily be converted into coefficients. The failure event is the exit so that each portfolio company is at risk during the holding period. If the fund exits the investment in several stages, we use the last transaction date in order to observe the return multiple and differentiate between exits over and under costs. Investments that are not exited by the end of our sample period are treated as right-censored with corrected estimators. 'Strict deal-by-deal' dummy takes the value of one if the GP is paid on a single deal basis getting paid after each single positive exit, and zero if the GP is paid on a fund as a whole basis. 'Log(investment cost)' describes the log of investments cost of capital. '1999Q1 to 2000Q1' dummy is a time-varying covariate: over the funds life, it equals one only in 1999Q1-2000Q2. 'q. return on Russell 2000' is the quarterly return on the Russell 2000 index. Another time-varying covariate is 'BAA cor. bond yield' measuring the yield on corporate bonds (using Moodys BAA bond index estimated quarterly in March, June, September, and December). Additional covariates are estimated as defined in Table 4. Standard errors are heteroscedasticity robust. All models are with time fixed effects. Standard errors, shown in brackets, are adjusted for clustering on fund (that is, investments undertaken by the same fund are not assumed to be independent). One/ two/ three asterisks represent two-tailed significance at a 10%/ 5%/1% level, respectively.

		(1)	(2)	(3)	(4)	(5)	(6)
	time-varying?			multiple $\geq 1$	multiple $\geq 1$	multiple $< 1$	multiple $< 1$
Strict deal-by-deal (vs WF)	no	1.353** (0.166)	1.413*** (0.165)	1.302 (0.222)	1.450** (0.242)	1.416*** (0.174)	1.438*** (0.183)
NPV mgmt. fee	no		1.013 (0.028)		1.007 (0.037)		1.017 (0.032)
Carried Interest	no		0.008*** (0.014)		0.000*** (0.000)		0.154 (0.290)
Yrs. rel. work exp.	no	1.009 (0.006)	1.012** (0.005)	1.016* (0.009)	1.021** (0.008)	1.006 (0.006)	1.007 (0.006)
TVTC.t.1	no	0.857** (0.066)	0.852** (0.061)	0.858 (0.101)	0.844 (0.088)	0.866** (0.057)	0.859** (0.062)
Log(investment cost)	no	0.588*** (0.033)	0.600*** (0.033)	0.614*** (0.071)	0.668*** (0.082)	0.518*** (0.039)	0.521*** (0.040)
1999Q1 to 2000Q1	yes	1.253 (0.393)	1.156 (0.361)	1.803 (0.901)	1.609 (0.833)	1.040 (0.237)	1.004 (0.229)
q. return on Russell 2000 (%)	yes	0.998 (0.003)	0.998 (0.003)	0.995 (0.004)	0.995 (0.004)	1.000 (0.003)	1.000 (0.003)
BAA cor. bond yield (in %)	yes	6.098 (6.836)	6.101 (6.883)	9.298 (13.440)	9.027 (12.924)	4.712 (6.028)	4.661 (5.977)
Observations		46,364	46,364	22,078	22,078	24,286	24,286

Robust seeform in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

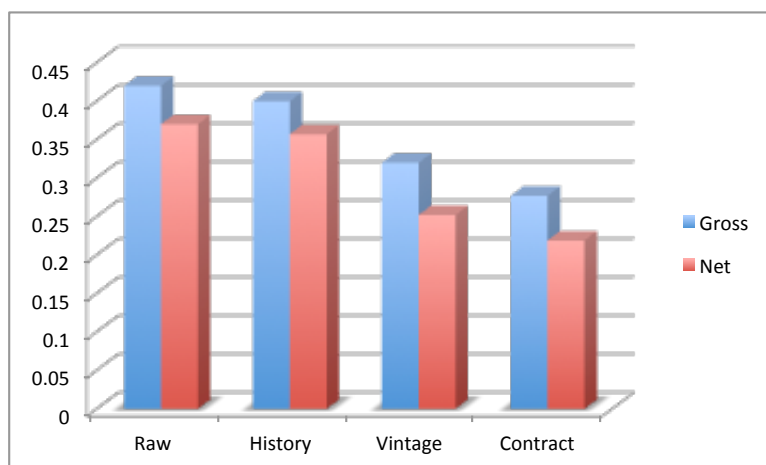


Figure 1: Summary of Performance Results

This figure summarizes the performance difference between deal-by-deal and whole fund carry timing. Blue columns are gross-of-fee performance, red are net-of-fee. The columns marked ‘Raw’ reflect the uncorrected differences from Table 3. ‘History’ summarizes column (1) of Table 5. The columns labeled “Vintage” adds vintage year fixed effects to the historical performance controls. This corresponds to Column (2) of Table 5. Finally, “Contract” adds contract terms; this is Column (6) from Table 5.

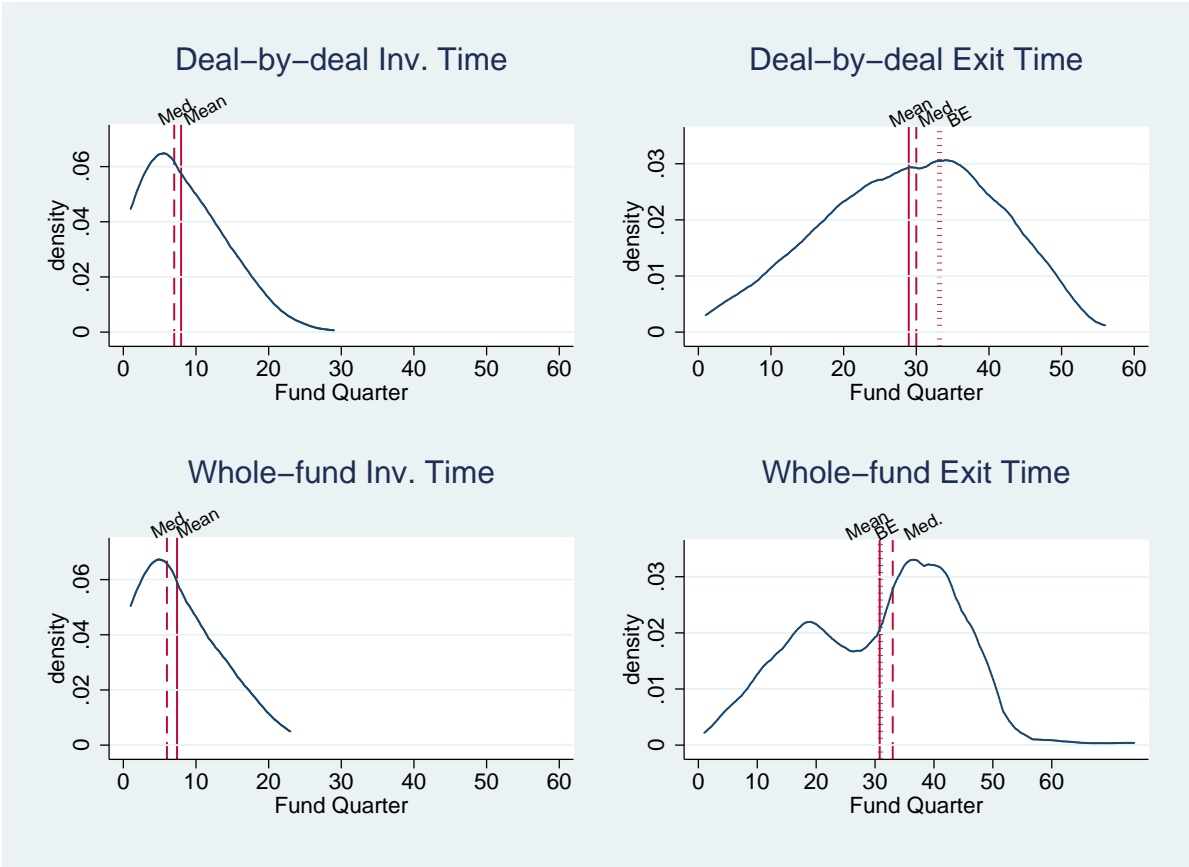


Figure 2: Portfolio Companies Investment and Exit Times by Fund Quarter  
 The left column of figures depicts the distribution of investment times for the two types of contracts as a function of fund age. This is generated by pooling all initial investments by fund age for each contract type and then plotting the distribution of investments. The right column of Figure 2 depicts the distribution of exit times by contract type.

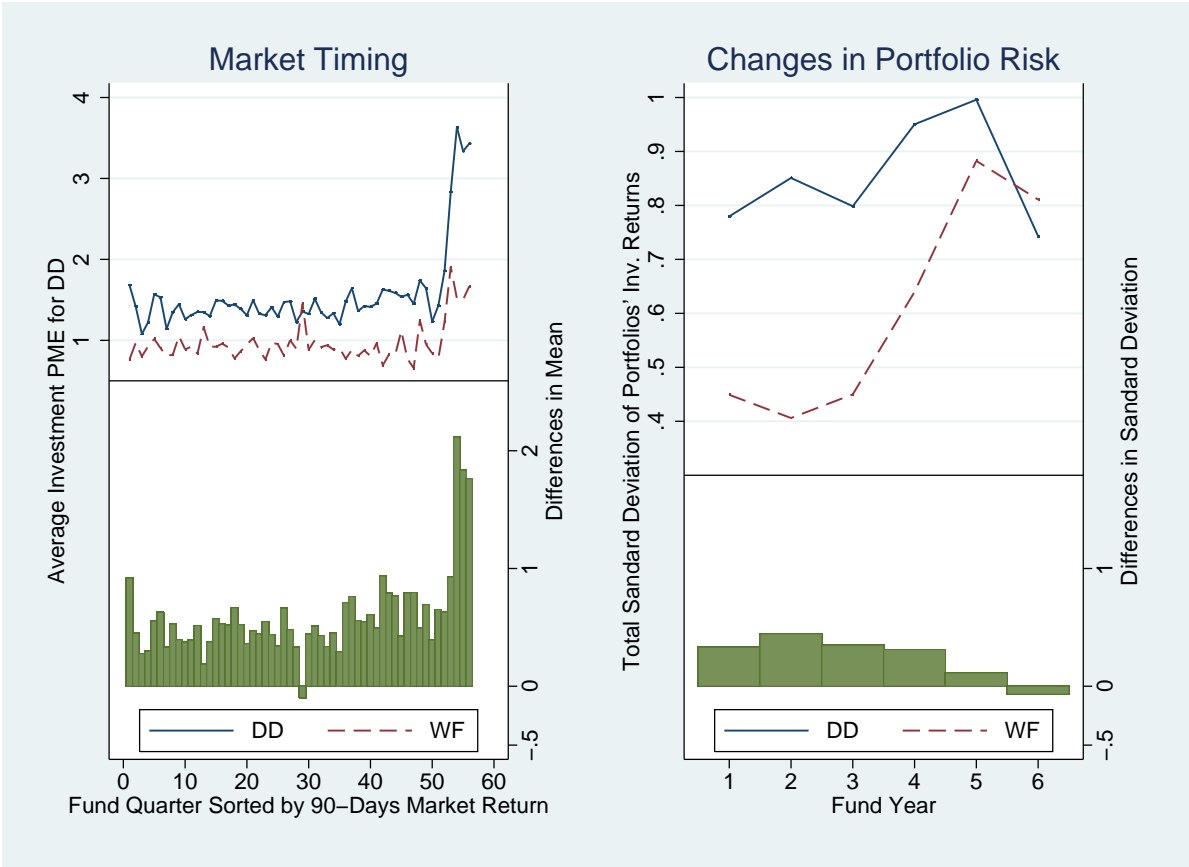


Figure 3: Market Timing and Changes in Portfolio Risk

## Appendix

Table 9: VC funds and Limited Partner market overview

In this table columns 2 and 3 show the number of newly committed capital and newly raised funds per vintage year. Dividing column 2 by 3 yields the average fund size (column 4). Taking into account the number of LPs (column 5) we can calculate the LP's average fund share (column 6). The table is based on data by Thomson One and PitchBook. Only VC funds with a US geographical focus are included.

Vintage year	Newly committed capital (in m USD)	# new funds	Avg. fund size (in m USD)	# LPs	LP's avg. fund share (in %)
(1)	(2)	(3)	(4)	(5)	(6)
1992	239	14	17	17	5.88
1993	1089	5	218	5	20.00
1994	355	17	21	17	5.88
1995	4290	78	55	53	1.89
1996	695	15	46	15	6.67
1997	9858	93	106	60	1.67
1998	8375	159	53	71	1.10
1999	9792	192	51	136	0.74
2000	9690	369	26	189	0.53
2001	9943	98	101	52	1.92
2002	3135	57	55	29	3.45
2003	11825	55	215	34	2.94
2004	4106	68	60	55	1.82
2005	116289	135	861	65	1.54
Average	13549	97	135	57	4.00