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Market Discipline in Asset Management

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european corporate governance institute

ECGI Working Paper Series in Finance

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Working Paper N° 558/2018

April 2018

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Keywords: Careers, Hedge Funds, Asset Managers, Market Discipline, Scarring Effects

JEL Classifications: G20, G23, J24, J62, J63

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Abstract

We establish that the labor market helps discipline asset managers via the impact of fund liquidations on their careers. Using hand-collected data on 1,948 professionals, we find that top managers working for funds liquidated after persistently poor relative performance suffer demotion entailing a yearly average compensation loss of $664,000. Scarring effects are absent when liquidations are preceded by normal performance or involve mid-level employees. Based on a model with moral hazard and adverse selection, we find that these results can be ascribed to reputation loss rather than bad luck. The findings suggest that performance-induced liquidations supplement compensation-based incentives.

1 Introduction

The salaries of employees in financial firms are typically much higher than those of non-finance employees with similar education, and tend to be more unstable: in 2006 the finance salary premium was 50% and the earnings of finance workers were 8% more dispersed than those of non-finance workers (Philippon and Reshef, 2012). Both of these features are more extreme in asset management, and particularly in the hedge fund industry. Indeed, the media often express skepticism that such high levels of pay can be in line with the performance of the corresponding funds or reflect managers' actual talent. For instance, in 2012 *The Economist* wrote: "It is ... easy to think of people who have become billionaires by managing hedge funds; it is far harder to think of any of their clients who have got as rich".[1]

In principle, the benefit of such a high compensation may be offset, at least partly, by the danger of possibly permanent career setbacks. The incentive problems in asset management obviously require leaving a considerable amount of risk on the shoulders of managers, especially those with the greatest decision-making power (see Murphy (1999) and Edmans et al. (2017)). Indeed, in this industry a substantial portion of compensation is performance-sensitive, with a fixed base salary supplemented by performance-related bonuses. However, the performance-based component is typically much more sensitive to upside than to downside risk.[2] Therefore, it is important to ask whether asset managers are exposed not just to the incentive mechanism of their compensation scheme (Agarwal et al., 2009), but also to the discipline imposed by the labor market, in the form of permanent career setbacks following underperformance. The question, that is, is whether the labor market acts as an additional device for disciplining asset managers, over and above the incentives within the firm. This is the research question we address here, and it is one on which there is no previous evidence.

We focus on professionals working in hedge funds, as incentive concerns and their career implications can be expected to be particularly salient in this segment of asset

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[1] "Rich managers, poor clients", 22 December 2012.

[2] This applies particularly to hedge fund managers, whose performance-based incentive fee effectively amounts to a call option written on the hedge fund's asset value, with a strike price determined by the "high watermark" and "hurdle rate" provisions, together with the value at which investors underwrite the fund. The high watermark provision states that the manager receives the incentive fee only if the fund's net asset value exceeds its previous peak; the hurdle rate is the minimum return above which the manager gets the incentive fee.

management, for three complementary reasons. First, the hedge fund industry is the quintessential business of risk-taking, where a single bad decision may blow up an entire fund. Second, hedge fund managers have the greatest discretion in their investment choices, owing to the lightly regulated nature of the business: the difficulty of monitoring and reining in top talent creates severe moral hazard, typically addressed by up-or-out contracts with dynamic incentives (Axelson and Bond, 2015). Third, hedge funds carry out very complex trades and arbitrage strategies, which require scarce and highly specialized talent. Hence, hedge fund management companies compete keenly for talent. This competition prevents insuring managers against performance shocks: as soon as their true quality is discovered, talented professionals extract all rents and the untalented can get no subsidy (Acharya et al., 2016).

We manually collected data on the careers of 1,948 individuals who at some point worked in a hedge fund (according to the Lipper-TASS database) as low, middle or top manager in the investment company managing the fund. Thus not all our sample of hedge fund managers eventually become CEOs (only 58% do): in this respect, our data differ from those used in most studies on managers' careers, which consider only CEOs. The resulting dataset covers employment histories from 1963 to 2016. For each individual, we observe gender, education, year of entry in the labor market, and all job changes within and across firms (not only hedge fund companies but also banks, insurance companies, mutual funds and non-financial companies). We classify jobs according to position within the hierarchy and typical compensation.

Upon being hired by a managing company, the professionals in our sample experience a significant acceleration of their career. The acceleration is greatest for those with high talent, as measured by graduate degrees from top universities and previous job experience in asset management, and for men, consistent with other evidence on gender bias in the finance industry. Career progress is also faster for those who get jobs in funds that outperformed their benchmark in the previous three years, which suggests that the respective parent companies have more financial firepower to allocate to recruitment, possibly due to greater fund inflows from investors.[3]

While entry into the hedge fund industry typically propels professionals quickly to high-level positions, it also exposes them to the danger of permanent setbacks upon the liquidation of the funds they work for. Hedge funds are particularly well

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[3]This is consistent with the evidence provided by Brown and Matsa (2016), based on applicants' responses to job postings during the recent crisis, that high-quality job seekers shy away from distressed financial firms.

suited to investigating how careers are affected by liquidations, as these are not rare events, especially in the wake of unsatisfactory performance. We find that such setbacks are quite severe in both job level and compensation, especially for high-ranking managers, and are frequently accompanied by switches to other employers. Following the liquidation of their funds, top executives (e.g. CEO, CFO, CIO etc.) suffer an average compensation loss of about $200,000, if the estimation is performed without conditioning on previous fund performance.

In principle, such "scarring effects" may result either from a loss of reputation ("skill") or from the accidental destruction of the managers' human capital, owing, say, to overall adverse market trends in the relevant fund class or the whole market ("luck"). We label these two interpretations respectively as the "market discipline" and the "career risk" hypotheses. To discriminate between them, we test whether "scarring effects" are concentrated in funds that consistently underperformed their benchmark before liquidation. We do so by estimating the effects of liquidation following underperformance over different time windows: increasing the window over which performance is observed raises the signal-to-noise ratio, and thus allows us to disentangle more accurately "skill" from "luck". We find that high-ranking managers of funds liquidated after 2 years of average underperformance suffer job demotion entailing an average compensation loss that is $664,000 larger than if their fund had performed normally before liquidation. But where preceded by normal performance, fund liquidation is not associated with career setback or significant compensation loss.

We interpret these findings in the light of a career model featuring moral hazard and adverse selection: funds' relative performance allows the market to gradually learn about managers' skills, and both performance pay and the danger of liquidation play a role in disciplining the choice of effort. Liquidations can be driven either by consistently poor relative performance or by reasons that are not performance-related. Persistently poor performance leads investors to become so pessimistic about the manager's skill that they can no longer profitably incentivize him. At this point, the fund has to be liquidated, after which the manager's poor reputation prevents him from being hired elsewhere.

Hence our model predicts that the scarring effects on a manager's career due to persistently poor relative performance reflect reputation loss and thus act as a disciplining device. Empirically, in fact, only such liquidations have scarring effects. The model also highlights that the market discipline arising from such liquidations gains

effectiveness as their frequency increases relative to the total number of liquidations, and as the scarring effects of fortuitous liquidations decrease. That is, if managers expect funds' liquidations to occur almost exclusively in the wake of underperformance and to carry no penalty otherwise, their incentive will come not only from the "carrot" of performance pay but also from the "stick" of career damage. In our sample 79% of the liquidated hedge funds performed worse than their benchmark in the previous two years, and no career setbacks are associated with fortuitous liquidations. Thus the model predicts that the "stick" of labor market discipline is a good complement to the "carrot" of compensation bonuses. In this sense, our findings nicely complement those of Gibbons and Murphy (1990), who provide empirical support for relative performance evaluation in CEO pay and retention policies. We show that the incentive effects of relative performance extend beyond the boundaries of the given firm's policies, to encompass also the hiring policies of subsequent employers.

In the banking sector, the evidence of labor market discipline is less clearcut. According to Griffin et al. (2018), senior executives of top banks who signed RMBS deals entailing large losses and misreporting rates or implicating the bank in lawsuits experienced no setbacks in their internal career or in their subsequent job opportunities. In contrast, Gao et al. (2017) document that, following negative credit events affecting their loan portfolios, managers working in banks underwriting syndicated loans were more likely to switch to a lower-ranked bank, and face demotion in their subsequent career.

Our evidence about the "scarring effects" of fund liquidations also relates to previous work on the effect of firm bankruptcies. Eckbo et al. (2016) report that only one third of CEOs maintain executive employment after a bankruptcy filing, especially when their firm's previous profitability was below the industry average, and departing CEOs suffer large income and equity losses. Graham et al. (2017) study how bankruptcies affect the careers of rank-and-file employees: they analyze matched employer-employee panel data from the US Census, documenting a persistent 15-percent drop in wages following bankruptcy.

Despite the superficial similarity, however, hedge fund liquidations are quite different from bankruptcies. As investment companies typically manage several funds, liquidating a fund rarely coincides with the closure of the firm and the forced reallocation of its employees to other employers. By the same token, the liquidation of a fund is a corporate decision that may convey information about the employees who worked for it. If it follows disappointing performance relative to other funds in the

same class, the liquidation could reflect a negative judgment about their skills and potential; alternatively, it could result simply from overall market trends that induce the relevant investment company to redeploy its resources–including personnel–to other sectors. So it is important to condition the career effects of liquidations on previous fund performance, to infer whether they follow from a revision of beliefs about employees' skills or the fortuitous loss of valuable human capital.

Our paper also adds to a strand of work on managerial careers that studies how macroeconomic or financial market conditions at the time of labor market entry affect employees' subsequent labor market outcomes: Oyer (2008) shows that a buoyant stock market encourages MBA students to go directly into investment banking upon graduation, with a large and lasting effect on their career. Schoar and Zuo (2017) find that CEOs' careers are durably affected by the macroeconomic conditions that prevail upon their original labor market entry. Similarly, Oreopoulos et al. (2012) find that people who graduate during recessions suffer an earnings gap that lasts ten years. Our work differs from these studies in focusing on the role of the labor market in rewarding "skill" (relative performance) rather than "luck" (general market or macroeconomic conditions).

The paper is organized as follows. In Section 2 we develop a model that formalizes our hypothesis for why fund liquidations exert market discipline in the asset management industry. Section 3 explains the construction of the data set, illustrates the structure of the data, and describes the characteristics of the sample managers and their careers. Section 4 investigates how careers evolve upon entry into the hedge fund industry, depending in part on employee and fund characteristics. Section 5 describes how careers differ between employees in liquidated hedge funds and a control group, depending on pre-liquidation job position and the funds' previous relative performance. Section 6 concludes.

2 Theory

The liquidation of a fund may be prompted by dissatisfaction with the perceived "skill" of its management, or by fortuitous circumstances outside its manager's control, i.e. bad "luck". In both cases the liquidation may in principle have scarring effects on a manager's subsequent career: in the first case through a reputation loss, in the second through a productivity loss upon switching to a new job.

In this section we present a model that encompasses both of these possible types

of liquidations (and implied scarring effects), and highlights two differences between them. First, only skill-related liquidations follow persistently poor relative performance. Second, only the scarring effects triggered by these liquidations have a market discipline effect, in the sense that their prospective occurrence encourages managers to exert effort, and thus complements the incentive effects of performance pay. In contrast, the likelihood of liquidations due to bad "luck" and the severity of their scarring effects tend to dilute the market discipline stemming from liquidations due to perceived lack of "skill": insofar as a manager expects to be terminated almost irrespective of his actions, he has little incentive to shine.

To capture these points, we construct a model of asset managers' careers where fund relative performance is affected both by moral hazard and adverse selection, and the market gradually infers managers' skills from performance. As we shall see, some of the key parameters of the model can be directly estimated from our data, allowing us to determine the strength of the market discipline exerted by liquidations in our hedge fund sample.

The model considers an infinite-horizon economy with a continuum of funds and managers, each fund being run by a single manager. Managers are scarce relative to the number of potential funds, so that competition leads managerial compensation to absorb all of the surplus generated by the fund in excess of the minimum target acceptable to investors. Both investors and managers are risk neutral, and have time discount factor ρ.

The return of fund i at time t is the sum of its benchmark return, i.e. that of the relevant fund class, and its return relative to the benchmark, i.e. its relative performance R_{it}. Both the fund's return and its benchmark are publicly observable. Hence so is its relative performance, defined $R_{it} \equiv \Delta_{it} - w_{it}$, where Δ_{it} is the gross return generated by manager i and w_{it} is his compensation at time t. The gross return Δ_{it} is determined by idiosyncratic forces, namely the talent and effort of the fund manager, as explained below.

A fund can be liquidated for either of two reasons. First, investors liquidate funds that are not expected to meet their target relative performance α, i.e. violate investors' participation constraint:

$$\mathbb{E}(R_{it} \mid \Omega_{t-1}) \geq \alpha, \tag{1}$$

where Ω_{t-1} denotes public information at time $t - 1$, including past values of the

fund's relative performance R_{it-s}, for $s > 0$. As we shall see, such performance-related liquidations make the respective fund managers effectively unemployable in the asset management industry, as also other investors will regard them as incapable of delivering a satisfactory performance.

Second, a fund may be liquidated irrespective of expected relative performance: even if the fund satisfies condition (1), at any time t it is liquidated with probability p due to adverse events affecting its whole class or the entire market, such as permanent shifts in policy or in risk appetite. In principle, also these liquidations may damage the subsequent career of the affected managers, by forcing them to take new jobs where their productivity drops by a fraction ϕ of its initial level: if $\phi = 1$, these liquidations have the same scarring effects as performance-related ones; at the other extreme, if $\phi = 0$ they have no scarring effects. Hence, even if fund i's expected performance is satisfactory, its manager's future compensation is expected to decline by a fraction $p\phi$. Accordingly, the manager's effective discount factor is $\beta \equiv \rho(1-p\phi)$: future compensation is discounted more heavily the greater the probability p of the fund being fortuitously liquidated, and the greater the associated income loss ϕ.

Managers differ in skill level: a fraction λ of them are good (G), and $1 - \lambda$ bad (B). A fund's relative performance depends both on the manager's quality and on his effort level. If run by a good manager, fund i's gross relative performance Δ_{it} is a Bernoulli random variable that equals $e \cdot \Delta$ with probability π, and 0 otherwise, where $e = \{0, 1\}$ is the manager's effort, chosen at the private cost $C = e \cdot c$. If run by a bad manager, instead, fund i invariably produces zero relative performance, even if the manager chooses $e = 1$.[4] While managers know their skill level, investors do not, nor can they observe managers' effort. Hence, asset management features both adverse selection and moral hazard.

Effort is assumed to be efficient, covering both its cost to the manager and the target return required by investors:

$$\pi\Delta > c + \alpha, \tag{2}$$

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[4]The results would be qualitatively unchanged if the assumption that bad managers always produce zero were relaxed: in this case, observing the payoff Δ would not *per se* imply that the manager's type is good, so that the market's updating about the manager's quality would be more complex and gradual than under our starker assumptions. Our results would be substantially unaffected also if low relative performance (produced by bad managers and by good but "unlucky" ones) were assumed to be negative rather than zero, as in our model.

so that under perfect information the fund is viable. Poor performance by managers cannot be penalized by negative earnings: the best that investors can do to attenuate moral hazard is to give them performance-based compensation, by which they receive a fee $w_{it} = w$ if $\Delta_{it} = \Delta$, and $w_{it} = 0$ if $\Delta_{it} = 0$.[5] Hence, fund i's relative performance is $R_{it} = \Delta - w$ in case of "success", and 0 otherwise. In a one-period setting, incentive compatibility requires that $\pi w \geq c$: the manager's fee given "success" cannot be less than c/π, to compensate him for the cost of effort.

Since the managerial labor market is competitive, however, the investors' participation constraint (1) is binding. Denoting investors' belief (at time t) that manager i is good by the conditional probability $\theta_{it} \equiv \Pr(G \mid \Omega_{t-1})$, compensation is determined by the condition $\mathbb{E}(R_{it} \mid \Omega_{t-1}) = \theta_t \pi (\Delta - w) = \alpha$. Hence, the competitive fee pledged to the manager in case of "success" at time t is

$$w_{it} = \Delta - \frac{\alpha}{\theta_{it} \pi}. \tag{3}$$

Note that in a one-period setting incentive compatibility would require $\pi w_{it} \geq c$, which together with the investors' participation constraint (3) implies

$$\pi \Delta \geq c + \frac{\alpha}{\theta_{it}}. \tag{4}$$

This condition is stronger than assumption (2), and is bound to be violated if the investors' perception of the manager's quality, θ_{it}, is sufficiently low. Since initially the belief about the manager's quality is the unconditional probability of him being good ($\theta_{i0} = \lambda$), in the extreme case where $\pi \Delta \leq c + \alpha/\lambda$ the fund will not even be able to get initial funding. However, as we shall see, this is not necessarily the case when managers allow for the danger of liquidation, which creates further "market discipline" in addition to that produced by performance pay.

2.1 Two useful benchmarks

To frame our ideas, let us consider two useful benchmark cases: (i) investors know the manager's skill level, and (ii) investors never liquidate the fund for poor relative

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[5]In practice the performance fee of hedge fund managers is based on absolute returns, which are partly determined by the performance of the benchmark. The results of the model would be qualitatively unaffected by positing such a compensation scheme. In fact, such a scheme would make incentive pay less effective in alleviating moral hazard and would therefore make the disciplinary role of liquidations all the more important.

performance.

If the manager's type is public information, so that there is moral hazard but no adverse selection, then bad managers will not get funding (they fail to meet condition (1)), while good managers will be funded and earn the competitive fee

$$w = \Delta - \frac{\alpha}{\pi} \equiv \overline{w} \qquad (5)$$

in case of "success", and zero otherwise, as we can see by setting $\theta_{it} = 1$ in (3). This compensation is incentive-compatible on a period-by-period basis (since $\pi\overline{w} > c$ by assumption (2)) and makes expected relative performance just equal to the investors' target: $\mathbb{E}(R_{it}) = \alpha$, for all t.

Next, consider what happens if investors do not know the manager's skill level, yet never liquidate the fund, being satisfied with the benchmark return ($\alpha = 0$). In this case, investors learn the manager's quality over time, but this does not trigger any incentive effect. This learning is very simple, as by assumption only good managers succeed. Thus, as soon as the fund reports a "success" (i.e. $\Delta_{it} = \Delta$), the manager is recognized as good ($\theta_{it} = 1$) and from then on always receives the fee $\overline{w} = \Delta$ in case of "success" (obtained by setting $\alpha = 0$ in (5)), and zero otherwise. Instead, whenever the manager's type is unknown, i.e. in the initial period 0 and in any period t after an uninterrupted sequence of "failures" ($\Delta_{it-s} = 0$, for $s = \{1, 2, ..., t\}$), the investors' belief is

$$\theta_{it} = \frac{\lambda(1-\pi)^t}{1 - \lambda + \lambda(1-\pi)^t}, \qquad (6)$$

so that $\theta_{i0} = \lambda$. Clearly, this belief is increasing in the quality of the manager pool, λ, and decreasing in good managers' probability of "success", π, and in the number of previous uninterrupted "failures", t. Hence, the longer the string of "failures", the more pessimistic investors become about the manager's quality. Nevertheless, if $\alpha = 0$, investors are willing to pay the fee $\overline{w} = \Delta$ upon "success" and earn $\mathbb{E}(R_{it} \mid \Omega_t) = 0$, without liquidating the fund even if their belief θ_{it} drops close to zero. The manager's compensation is incentive-compatible on a period-by-period basis, as $\pi\Delta \geq c$ holds by assumption (2). Hence, in this case, even though investors gradually learn about the manager's type, their compensation policy is unaffected: absent liquidation, learning does not translate into "market discipline".

The question is whether it is appropriate, given that the problem is dynamic, to verify incentive compatibility on a period-by-period basis. It turns out that in the two cases just analyzed it is appropriate, because the expected value of the future

payoffs is not affected by the current choice of effort. To see this, consider that from the standpoint of a good manager who exerts effort in each future period, the payoff (compensation net of effort cost) can be described by an infinite binomial tree where the node at each time t leads with probability π to a payoff $\beta^t(\overline{w} - c)$ and with probability $1 - \pi$ to a payoff $-\beta^t c$. As the tree is the same starting from any node, its expected value is the same at each date t:

$$V_t = \frac{\pi \overline{w} - c}{1 - \beta}. \tag{7}$$

Since the manager expects the same continuation value V_t irrespective of current "failure" or "success" (and investors' belief θ_t), the incentive compatibility constraint is the same as in the one-period case.

2.2   Enter liquidation

If investors have a positive target for expected relative performance ($\alpha > 0$), they will want to liquidate the fund when their belief about the manager's skill becomes sufficiently pessimistic, following a long enough sequence of "failures". The intuitive reason for this is that, in order to obtain their expected target return, they have to reduce the compensation promised to the manager for "success"; but if "failures" persist long enough, this reduction becomes so great as to thwart the manager's incentives. At that point, the investors' participation constraint (1) is violated, and the fund must be liquidated. Interestingly, the manager of a fund liquidated after persistent "failures" will not be taken on by other fund investors as a fund manager, since he does not satisfy their participation constraint either: his post-liquidation compensation is zero, i.e. liquidation after continuing poor relative performance produces "scarring effects". By contrast, it does not if the fund is liquidated after a "success", as in this case the liquidation does not affect investors' beliefs about the manager's skill.

If liquidation occurs at time t^*, a good manager's binomial payoff tree is no longer symmetric, as in the benchmark cases described in Section 2.1. Rather, the branch associated with the first t^* "failures" leads with probability $(1 - \pi)^{t^*}$ to the liquidation node, which yields a payoff of zero forever after (see Figure 1, where $t^* = 2$). To derive the incentive compatibility constraint in the period prior to possible liquidation, consider the two possible situations that may arise at $t = 1$:

1. After "success" at $t = 0$ (the upper node in the figure), the manager is recognized as good ($\theta_t = 1$) and from then on always receives the fee $\overline{w}$ in (5) in case of further "successes" and zero otherwise, which as we know is incentive-compatible and satisfies investors' participation constraint. The continuation value V_1 of the manager's expected subsequent payoffs is given by (7) regardless of future "success" or "failure", so it does not affect the manager's incentives, as in the benchmark cases of Section 2.1. Importantly, this applies to all nodes with a "success".

2. Instead, "failure" at $t = 0$ (the lower node) leaves the manager's type uncertain, and in fact by (6) the investors' belief about the manager's skill drops below its unconditional value $\theta_{i0} = \lambda$:

$$\theta_{i1} = \frac{\lambda(1 - \pi)}{(1 - \lambda\pi)} < \lambda,$$

and by (3) the fee pledged to the manager upon success at $t = 1$ is

$$w_1 = \Delta - \frac{\alpha}{\theta_{i1}\pi} < w_0 = \Delta - \frac{\alpha}{\lambda\pi}.$$

However, the manager's incentives are affected not only by the fee w_1 that he expects for "success" at $t = 1$ but also by the threat of liquidation at $t = 2$ if he were to fail again at $t = 1$. Indeed, in this case, the manager's expected continuation payoff differs depending on whether he succeeds or fails at $t = 1$: in case of "success", $V_1(\Delta_{i1} = \Delta)$ is given by (7), while in case of "failure" $V_1(\Delta_{i1} = 0) = 0$. Hence, after "failure" at $t = 0$ the manager's incentive constraint is

$$\pi\left[w_1 + \beta V_1(\Delta_{i1} = \Delta)\right] = \pi\left[\Delta - \frac{\alpha}{\theta_{i1}\pi} + \beta\frac{\pi\overline{w} - c}{1 - \beta}\right] \geq c, \tag{8}$$

where the term $\beta V_1(\Delta_{i1} = \Delta)$ is the "market discipline" effect of liquidation at $t = 2$, which supplements compensation w_1 as an incentive to the manager's performance at $t = 1$. It is easy to show that it also supplements the effect of compensation w_0 in raising his incentive to perform at $t = 0$.[6]

For liquidation to occur in case of "failure" at $t = 1$, the analogue of condition

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[6]Suppose initially that $\pi\Delta - \alpha/\lambda > c$, so that at $t = 0$ compensation would be the sole incentive.

(8) at $t = 2$ must be violated, namely:

$$\pi \left[w_2 + \beta V_2(\Delta_{i2} = \Delta) \right] = \pi \left[\Delta - \frac{\alpha}{\theta_{i2}\pi} + \beta \frac{\pi\overline{w} - c}{1 - \beta} \right] < c. \tag{9}$$

Inequalities (8) and (9), together with expressions (5) and (6), yield the following conditions for liquidation to occur at $t = 2$:

$$\frac{1}{1 - \pi} \leq \frac{\lambda(\pi\Delta - \alpha - c)}{(1 - \lambda)\alpha} \left(1 + \frac{\beta\pi}{1 - \beta} \right) < \frac{1}{(1 - \pi)^2}.$$

More generally, the liquidation date is $t^* = \lceil \tau \rceil$, i.e. the smallest integer larger than the real number τ that solves

$$\left(\frac{1}{1 - \pi} \right)^\tau = \frac{\lambda(\pi\Delta - \alpha - c)}{(1 - \lambda)\alpha} \left(1 + \frac{\beta\pi}{1 - \beta} \right), \tag{10}$$

where the left-hand side is increasing in τ, and therefore in t^*, since $\pi < 1$.

Expression (10) implies that the more severe the information asymmetry, the less tolerant investors are of persistently poor relative performance: the time to liquidation t^* is decreasing in the severity of moral hazard (low productivity Δ and high private cost c of managerial effort) or adverse selection (low quality of the manager pool λ). Intuitively, when information problems are worse, underperformance results in a sharper fall in the manager's reputation, inducing investors to cut in the manager's fees more deeply, and thus bringing forward the moment when he is no longer willing to exert effort. Liquidation is also hastened if investors set a more demanding target rate α.

The most interesting result in comparative statics is that the time t^* to liquidation

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The incentive-compatibility constraint at $t = 0$,

$$\pi \left\{ \left[w_0 + \beta V_0(\Delta_{i0} = \Delta) \right] - \pi\beta \left[(w_1 - c) + \beta V_1(\Delta_{i1} = \Delta) \right] \right\} > c,$$

can be rewritten as

$$\pi \left\{ \left[\Delta - \frac{\alpha}{\lambda\pi} + \beta \frac{\pi\overline{w} - c}{1 - \beta} \right] - \beta\pi \left[\left(\Delta - \frac{\alpha}{\theta_1\pi} - c \right) + \beta \frac{\pi\overline{w} - c}{1 - \beta} \right] \right\} > c.$$

Given that $\pi\Delta - \alpha/\lambda > c$, and recalling that $\Delta - \frac{\alpha}{\theta_{i1}\pi} - c < \pi\overline{w} - c$, a sufficient condition for the previous inequality is

$$(1 - \pi\beta) \frac{\pi\overline{w} - c}{1 - \beta} > 0,$$

which is true. Since this is just a sufficient condition, the incentive-compatibility constraint at $t = 0$ can hold even if $\pi\Delta - \alpha/\lambda < c$.

is increasing in the parameter β, namely the manager's effective discount factor. Recalling that $\beta \equiv \rho(1 - p\phi)$, expression (10) implies that the time t^* to liquidation is decreasing in the probability p that the fund is fortuitously liquidated and in the resulting fractional income loss ϕ. Intuitively, if these two parameters are high (close to 1), so that β is low (close to 0), the fund is likely to be liquidated regardless of its relative performance and such fortuitous liquidation would result in large scarring effects for the manager. This dilutes the incentive effect of liquidation, and thus brings forward the date at which the fund must be liquidated. Conversely, if the probability p of fortuitous liquidation and/or the severity of its scarring effects ϕ are low (close to 0), then β is high (close to the time discount factor ρ), and the "market discipline" effect of liquidation is commensurately large: being confident that the liquidation will occur only if the fund performs worse than its benchmark, the manager will have strong incentive to shine, and this will induce investors to tolerate a longer period of underperformance before triggering liquidation. This is not only because they gradually learn about the manager's skill, but also because the discipline from liquidation itself gives the manager credibility in the eyes of investors. Our data enable us to estimate the parameters p and ϕ, and thus measure the strength of the "market discipline" from liquidation.

3   The Data

We collected data on the characteristics and career paths of professionals who were employees at least part of the time from 2007 to 2014 – traders, analysts, portfolio managers, top executives – in an investment company present in the Lipper Hedge Fund Database (TASS).[7] Most of the professionals in the sample also held positions in other companies in the course of their careers, at other asset management companies (managing mutual funds, pension funds, private equity funds, etc.), banks, insurance companies, consultancies or even non-financial companies. Some worked for more than one employer at the same time. This occurs almost exclusively for high-ranking positions: for instance, the COO of a company may also be the managing director of another, possibly within the same group. When employed by an investment company

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[7]TASS contains quantitative and qualitative information about 21,000 hedge funds, such as monthly performance, addresses, inception date, investment focus, management and parent company, plus the names of employees, the investment company employing them, the hedge funds for which they worked and their job title.

that manages several funds, the same professional may operate in multiple funds.

To construct the data set, we draw the names of 13,056 hedge fund professionals from the TASS database on hedge fund managers, the investment companies that employ them, and the funds managed by the company. Crucially, this database can link a professional employed by a given investment company with the hedge funds managed. This information allows us to identify the professionals that are potentially affected by fund-level events such as liquidations.

To complement the information provided by TASS with previous and subsequent work histories, we hand-collected data on education (degrees and dates, subject and school for each degree), year of the first job, and start dates, end dates, employers and job levels throughout the career. The data are drawn from the individual resumes available on a major professional networking website, and from Bloomberg, Businessweek and company websites. A good many employment histories were excluded as missing or too incomplete, resulting in a final sample of 1,948 managers. Consequently, our sample may under-represent both the least and the most successful professionals, as professionals in both tails of the distribution may have less incentive to update their public profiles, though for opposite reasons: the least successful because they have less to be proud of, the most successful because they are are less likely to search for new jobs.

We classify the jobs in our sample along two dimensions: their position within the corporate hierarchy, and the typical compensation associated with each job title and sector. We first match the job titles reported in the resumes with the Standard Occupational Classification (SOC) produced by the Bureau of Labor Statistics (BLS). Then, in order to create a measure of the position of an employee in the company's job ladder, we group the SOC codes into six bins, designed to capture different degrees of decision-making power:[8]

1. Craft Workers, Operatives, Labors and Helpers, and Service Workers;

2. Technicians, Sales Workers, and Administrative Support Workers;

3. Professionals;

4. First/Mid Officers and Managers;

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[8]These job bins are based on the EEO-1 Job Classification system, except for top managers, grouped in a separate bin.

5. Top Executives (except for CEOs and similar positions);

6. CEOs, or other positions at the head of the corporate hierarchy.

Since the same hierarchical position may have different compensation in different sectors (e.g., a Chief Operating Officer typically earns more in asset management than in commercial banking), we assign each employer in our sample to one of six sectors: (i) asset management (AM), (ii) commercial banking and other lending institutions (CB); (iii) financial conglomerates, defined as institutions encompassing lending, insurance and/or asset management (CO); (iv) insurance (IN); (v) other finance, which includes mainly financial consultancy and portfolio advisors (OF); and non-financial firms, government entities, supranational institutions and stock exchanges (NF). We identify the sectors of 2,129 employers present in our sample based on information available in their websites, LinkedIn webpages and online financial press. To determine the sectors of the remaining 4,642 employers, we use a machine learning algorithm that exploits the association between job titles and sectors: certain titles are found exclusively, or at least much more commonly, in some sectors than in others. For instance, a loan officer is typically found in commercial banking, a trader in asset management and an insurance agent in insurance. For the sub-sample of 2,129 employers sorted manually into our six sectors, we know the employee job titles. The algorithm detects systematic associations between sectors and job titles on the basis of this manually matched sub-sample and exploits them to sort the remaining 4,642 employers. A detailed description of the algorithm is provided in the Appendix.

Once all the individuals in our sample are sorted into sectors, we can impute their annual compensation. For job levels 1 to 4, the imputed compensation is the average salary corresponding to each SOC code and sector, based on the 2016 Occupational Employment Statistics (OES). Since the OES database does not contain information about the variable component of compensation, which is very large for job levels 5 and 6, we impute compensation for these job levels from data drawn from 10-K forms available through the Edgar system, which report both the fixed and variable components of top management pay. Specifically, we hand-collect data from the annual 10-K statements and proxy statements filed by firms with the SEC on total compensation and its components (salary, bonus, stock options and stock-based remuneration) awarded in 2015 to the top five executives by the boards of the

listed firms in the financial industry.[9] We end up with the following: (i) 114 firms in asset management, (ii) 388 in commercial banking and other lending institutions, (iii) 22 financial conglomerates, (iv) 109 insurance firms, and (v) 244 firms defined as "other finance" (mainly financial consultancies and portfolio advisors). To impute the executive compensation awarded by non-financial firms we randomly choose 400 firms in the service sector.

The end result is an imputed compensation for each job title and sector. For individuals employed by more than one company at a time, we keep track of all their positions, defining their job level as the highest one held at any moment and their compensation as that associated with the corresponding SOC code and sector. Table 1 reports the average compensation of professionals in our sample for each level, where the average is computed for our entire sample. The table also lists examples of job titles associated with each level: for obvious reasons of space, the table cannot report the thousands of job titles present in our data. The main point is that compensation varies not only across the six job levels shown in the table, but also, within each level, with the SOC code for the relevant job title and, within each SOC code, with sector. For instance, the compensation of professionals (level-3 employees) ranges between $30,000 and $205,000, and that of mid-level managers (level-4 employees) between $65,000 and $221,000.[10]

The table shows that the steepest increases in total compensation come in the step from middle management (level 4) to top management (level 5), which brings more than a nine-fold pay rise, and from the latter to positions such as CEO or executive director (level 6), where compensation more than doubles. These two jumps consist mostly in the variable component (bonuses, stock and options), which is included only for level 5 and 6. On average, the variable component of compensation amounts to $1,247,797 for level-5 and $3,214,088 for level-6 jobs, i.e. 79% and 87% of total compensation, respectively.

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[9]The titles of the top five executives vary. We collect compensation data for Chief Executive Officers (or Chairmen and Chief Executive Officers) and other executives such as the Chief Financial Officers, Chief Operating Officers, Vice President, Accounting and Corporate Controller, Principal Accounting Officer Vice President, Accounting and Corporate Controller, Principal Accounting Officer, Senior Vice President, Senior Vice President and General Manager, Senior Vice President, Corporate Development and General Counsel, etc. Chairmen and CEOs are classified as job level 6, all the others as level 5.

[10]Since OES salary data are available at the relevant level of disaggregation only since 2005, we ignore time-series variation in salary levels for the same SOC code and sector, simply in order to avoid the inconsistencies that would be generated by combining actual and imputed data.

3.1 Characteristics of Professionals and Careers

Table 2 reports the characteristics of the individuals in our sample. All those who report educational attainment (83 percent) have a university degree: B.A. or B.S. for 39 percent of the sample, Master's for 41 percent, and Ph.D. or J.D. for 3 percent. As one would expect, education in economics or finance is dominant: 59 percent of the individuals in the sample received their highest degree in these subjects. A sizable minority (16 percent) obtained their highest degree from a top-15 university, according to QS Ranking, and a smaller group (6 percent) received it from a mid-level university (ranked 16th to 40th). By age, the cohort that started working in the 1990s is overweighted (almost half the sample), those that started in the 1980s and 2000s are 22 and 28 percent respectively, and only 4 percent started before 1980. Consistently with anecdotal evidence about gender imbalance in finance, the sample is male-dominated (83 percent).

By construction, our sample careers are dominated by the asset management industry, with 75 percent of all our person-year observations. However, some of the professionals in the sample spend part of their careers in commercial banking (6 percent of person-year observations) or outside finance (15 percent). The median job level in the sample is middle management (level 4 in our classification), with a median compensation of $221,000. The average compensation is much higher ($1,582,000), reflecting the extremely skewed income distribution of the financial industry. Individuals do not change only job levels but also companies in the course of their careers: 13 percent of person-year observations feature switches of employer.

A considerable number of individuals in our sample attain top positions: 33 percent of person-year observations refer to individuals holding level-6 jobs (Table 2 and Figure 2). The figure also reveals that mid-management positions are the next most common in the sample. The prevalence of managerial positions reflects the fact that the sample consists entirely of professionals who at some point in their career held jobs in the hedge fund industry, which typically attracts highly talented individuals. That is, our data set presumably over-represents talented workers, like studies of careers of graduates from prestigious universities, such as Oyer (2008).

However, our sample does not consist only of people who eventually become CEOs, as in Benmelech and Frydman (2015), Graham et al. (2013), Kaplan et al. (2012), and Malmendier et al. (2011). Unlike these studies, ours also includes individuals who rise only to low- or mid-level managerial positions, or even drop from a top position to a lower one.

[Insert Figure 2]

Figure 3 illustrates career paths by plotting average compensation against work experience, showing total compensation and its fixed component separately. On average, the fixed component starts off at $150,000 and levels off at $200,000 after 15 years. In contrast, total compensation starts at about $1,000,000 and keeps rising throughout the career to triple after 45 years, although most of the increase comes in the first 25 years. This underscores the enormous importance of the variable pay component for asset management professionals.

[Insert Figure 3]

Where Figure 3 illustrates the career path in terms of compensation, Figure 4 describes it in terms of position on the corporate ladder, i.e. job level. The progression is shown separately for three cohorts, namely those who entered the labor market in the 1980s, 1990s and 2000s. Those entering in the 1980s and 1990s feature the same typical career path, but that of the cohort entering in the 2000s differs significantly. These younger managers progress more slowly in the first 15 years of the career, and then experience a setback. This can be probably be attributed to the fact that managers who started in the 2000s did not benefit from the earlier boom of the hedge fund industry and instead were hit by the crisis while still in the early phase of their careers, while their seniors had already reached top positions that sheltered them from the effects of the crisis.

[Insert Figure 4]

3.2 Hedge Fund Returns

The data on hedge fund returns come from TASS. Hedge funds are classified by strategy, as described by TASS and grouped into six classes by Agarwal, Daniel and Naik (2009, pp. 2252-3): relative value, security selection, multiprocess, directional

trading, funds of funds, and "other". Panel A of Table 3 gives descriptive statistics for the 19,367 hedge funds in the TASS database: Panel B reports the statistics for our sample of 4,944 funds.

The first two rows of Panel A display the mean and the standard deviation of the benchmarks' monthly percentage returns, defined as the average monthly return of the funds in the class for the whole sample period. As expected, given their high-risk strategies, the average benchmark returns are quite high, ranging from 0.73% per month for relative value funds to 1.32% for security selection funds; and their volatility is correspondingly high. The third row shows the high dispersion of relative performance around the benchmarks, especially in the classes where the benchmark return is itself more variable. The fourth row gives the breakdown of funds across the six classes.

[Insert Table 4]

On average, the performance of the funds in our sample is quite close to that of the TASS fund population; this is witnessed by the fact that the funds in our sample feature a very small average relative performance within each class, as shown by the first row of Panel B in Table 4. Moreover, in our sample too there is considerable dispersion in relative performance (see the standard deviations in the second row of Panel B). This heterogeneity will prove to be important in analyzing the effect of liquidations on individual careers in Section 5, where we examine how the effect varies with the fund's relative performance. Finally, the breakdown of our sample among the six classes is broadly in line with that of TASS, although over-representing security selection funds and under-representing multiprocess funds and funds-of-funds.

4   Career Paths in the Hedge Fund Industry

Our data on the career profiles of finance professionals enables us to determine, first of all, whether the evidence is consistent with the popular belief that being hired by a hedge fund brings enormous career advancement and earnings gains, and to investigate whether such advancement is correlated with managers' talent and funds' performance. In Section 5, we seek to determine whether this industry also exposes managers to the danger of career setbacks.

Figure 5 provides descriptive evidence on career advancement after hiring by a hedge fund company, i.e. the average job level and compensation of 1,379 individuals

joining such a company for the first time. Entry into the industry does in fact coincide with a remarkable career leap: the job level jumps by almost a full notch (from an average of 3.8 to 4.6) and then continues to rise gradually by a further half-notch over the subsequent 30 years; similarly, compensation jumps by about $750,000 in the first year and by another $1,000,000 over the next 30 years. Interestingly, entering the hedge fund industry is associated with considerably greater career advancement than switching employers earlier in one's career, which coincides with an average rise of 0.42 notches in job level and $386,000 in compensation.

[Insert Figure 5]

To assess whether the career advancement associated with entry into a hedge fund relates to the characteristics of the employee and of the fund, we estimate the following regression (in the most complete specification):

$$
\begin{aligned}
y_{it} \;=\;\; & \beta_1 education_i + \beta_2 experience_{it} + \beta_3 AM\_experience_{it} + \beta_4 female_i + \beta_5 y_{it-1} \\
& + \gamma_1 r_{jt-1} + \gamma_2 b_{jt-1} + \gamma_3 aum_{jt-1} + \gamma_4 style_j + \lambda_c + \epsilon_{it},
\end{aligned}
\tag{11}
$$

where y_{it} denotes the change in either (i) the job level or (ii) the compensation of individual i upon being hired by a hedge fund company for the first time in year t; $education_i$ is a dummy equal to 1 if individual i has a graduate degree from a top-15 university and to 0 otherwise; $experience_i$ is the number of years since entry of individual i into the labor market, and $AM\_experience$ is the number of years spent working in the asset management industry; $female_i$ is a dummy equal to 1 for women and 0 for men; r_{jt} is the average performance of fund j relative to its benchmark in the three years before the hiring of individual i; b_{jt} is the average return of the benchmark of fund j over the same interval; aum_{jt-1} is the logarithm of the assets under management of fund j in the previous year; $style_j$ is a set of six dummies capturing the investment style of the hedge fund; and λ_c are fixed effects for three cohorts, namely people who entered the labor market before 1990, between 1990 and 2000, and after 2000. The specification allows the baseline impact of being hired by a hedge fund company on the job level (or compensation) to vary depending on the individual's previous job level or compensation y_{it-1}, as individuals who start from higher positions presumably have less room for advancement.

Tables 4 and 5 show the coefficient estimates of equation (11). The dependent variable in Table 4 is the job level and in Table 5 the compensation, both measured

upon entry into the hedge fund industry. In each table, column 1 reports the estimates for a simple specification that includes only employee characteristics, column 2 adds the performance and benchmark of the relevant hedge fund, column 3 adds the size and style of the hedge fund, and column 4 the cohort dummies. The *education* variable captures not only the level but also the quality of education, and so can be taken as a measure of the observable component of talent. Hence, the positive and significant estimate of β_1 can be read as evidence that talent is rewarded in the hedge fund industry: a graduate degree from a top-15 university is associated with a job level one third of a notch higher and an increase in compensation ranging between \$121,000 and \$306,000 (though not significant in all specifications). The career and compensation advance upon entering the hedge fund industry is also strongly related to *experience*, and even more to the time spent working in asset management: each year of asset management experience is associated with a further increase in compensation of \$24,000 to \$36,000, depending on specification. In line with much evidence about the gender gap in finance (Adams and Kirchmaier (2016), Bertrand et al. (2010) and Bertrand and Hallock (2001)), the career progress of women upon entering the hedge fund industry is half a notch lower than that of men, and their compensation increase is between \$589,000 and \$800,000 lower depending on the specification. Notably, the coefficient of the *female* dummy in the compensation regressions is the most precisely estimated in all specifications.

[Insert Tables 4 and 5]

The job level change is also positively and significantly correlated with the previous relative performance of the fund to which the individual is assigned; in the compensation regressions this coefficient is significantly different from zero in columns 2 and 3. A possible interpretation of these findings is that better relative performance enables the investment company to offer more attractive positions to new hires, either because it can attract larger net inflows from investors (thus permitting a greater workforce expansion) or because it allows the company to reward its employees with internal promotions. In other words, the better-performing funds have more muscle on the managerial labor market.[11] This does not apply to hedge fund classes as such,

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[11] In the asset management literature, there is evidence that institutional investors hire managers who previously generated large positive excess returns, although this return-chasing does not appear to result in subsequent excess performance (Goyal and Wahal, 2008; Busse et al., 2010).

however: neither the job level nor the compensation changes are significantly correlated with the benchmark return of the relevant fund. Nor does fund size appear to contribute to the career advancement of new hires.[12]

To summarize, our data corroborate the common opinion that hedge fund managers are very well paid, even when benchmarked against their previous pay in other segments of the finance industry. But the data also indicate that their career and salary premia at least partly reflect their "skill", as captured by the quality and level of their education, and their experience in asset management. Hence, the labor market for hedge fund managers appears to reward talent, to some extent. The next section investigates whether it also punishes them for poor performance, reassessing their ability and demoting them accordingly.

5 Career Paths after Fund Liquidations

Here we seek to determine whether the career path of asset managers is significantly altered after the liquidation of the funds where they work, by comparison with managers whose funds are not wound up. Hedge funds are particularly well suited to this issue, in that their performance is very volatile and they are liquidated often, especially when performance is unsatisfactory: 31% of the hedge funds in the TASS database between 1994 and 2014 were eventually wound up. Specifically, the question is whether, following the liquidation of a hedge fund, the labor market options of its employees are affected adversely, and in particular whether this effect is more pronounced for high-ranking managers, who have more to lose.

As we shall see, there is evidence of this "scarring effect", especially for high-ranking managers. Note that our sample is biased against such scarring effects, to the extent that people tend to under-report career setbacks in their profiles on professional websites. In this sense, the effects we estimate should perhaps be seen as a lower bound.

In principle, as the model in Section 2 shows, the scarring effect of fund liquidations may have two, not necessarily mutually exclusive, causes. First, the liquidation

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[12]In unreported regressions, we investigate whether career advancement is significantly correlated with fund performance also after the hire, and find no evidence for such further association. However, we find a significant positive correlation between the career advancement of individuals when they enter the hedge fund industry and the subsequent performance of the fund in which they work. This suggests that, on average, individuals who experience a larger career advance at the entry stage are also likely to earn higher bonus pay subsequently.

may trigger a reputation loss for the asset managers, with repercussions on their subsequent careers. We refer to this as the "market discipline" hypothesis. Second, fund managers may suffer a career slowdown without any reputational loss, simply because the liquidation happens to force managers to take new positions where they are less productive. We label this the "career risk" hypothesis.

The model of Section 2 allows us to characterize these two hypotheses. By the "market discipline" hypothesis, a winding-up should disclose the manager's quality only when it follows underperformance that persists sufficiently long to be unlikely to reflect high-frequency noise. In this case, the scarring effects should be interpreted as the reflection of reputation loss and, *ex ante*, should have a disciplinary role.

The "career risk" hypothesis, instead, predicts that a liquidation can be associated with scarring effects even when the fund has performed broadly in line with its benchmark. For instance, this may occur when the benchmark itself performed poorly, inducing fund outflows from the relevant investment class and triggering liquidations. In this case, the liquidation conveys no information about managers' quality, but they may nevertheless suffer a subsequent career slowdown: even when liquidation results simply from reaching a planned terminal date or an internal reorganization of the parent investment company, it may inflict a loss of human capital on the fund managers involved. For instance, the reorganization may entail outright exit from the fund class in which the manager is specialized, causing redundancy and forced acceptance of a lower-level position elsewhere.

In what follows, we first document that fund liquidations are indeed associated with scarring effects (Section 5.1) and investigate whether they are greater for high-ranking managers. Next, we test whether the effects reflect "market discipline" or "career risk", or both (Section 5.2).

5.1   Scarring Effect of Liquidations

In order to determine whether fund liquidations adversely affect employees' subsequent job levels and salaries, we use a diff-in-diff framework, comparing the evolution of the careers of employees that experience liquidation at different dates with that of similar employees who do not. This method controls for unobserved talent by including individual fixed effects, and for the differences in individual career paths associated with observable differences in education, experience, gender and initial job level by building a control sample with matching characteristics. Both controls

are required to clear the ground of the possible correlation between liquidations and career outcomes induced by assortative matching between funds and managers: the liquidated funds may have been run by less talented managers, who would have had lackluster careers anyway. Individual fixed effects remove the impact of differences in unobserved talent on job levels and salaries, while the matching procedure filters out the influence of observed characteristics.

In addition, there is substantial variation in the timing of the liquidations (Figure 6). Though there are peaks coinciding with the market turbulence of 2008-10 and 2011, many liquidations also occur in normal times. This strengthens the external validity of our estimates: if funds were wound up only in financial crises, their scarring effects might be compounded by a particularly unfavorable labor market for people seeking new jobs.

[Insert Figure 6]

Our event of interest is the first fund liquidation that an employee experiences; in our sample this involves 661 employees (out of a total of 1,948). TASS gives eight different reasons why funds exit its database of "live funds" (and enter its separate "graveyard" database), the most frequent being liquidation (48.44%).[13]

Each individual who experiences a fund liquidation is paired with a control individual in the calendar year before the liquidation via propensity score matching. The matching algorithm that we use is one-to-one nearest neighbor matching without replacement, and the propensity score is based on education, experience, education quality, gender, job level, change in job level and an indicator for employment in asset management in the year before the liquidation. This provides a counterfactual career development, namely, the time path that the job level, salary or company switches would have followed in the absence of liquidation. After the matching procedure, we are left with 582 individuals in the sample of liquidated funds and an equal number in the control sample.

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[13]The other reasons are (i) "fund no longer reporting" (22.33%); (ii) "unable to contact fund" (18.58%), (iii) "fund has merged into another entity" (6.02%); (iv) "fund closed to new investment" (0.96%), (v) "fund dormant" (0.59%), (vi) "programme closed" (0.54%), and (vii) "unknown" (2.54%). In what follows, we exploit these alternative reasons for fund terminations to conduct robustness tests.

Our specification controls for individual effects and for time effects:

$$y_{it} = \alpha_i + \lambda_t + \sum_{k=-5}^{5} \delta_k L_{it}^k + \epsilon_{it}, \tag{12}$$

where y_{it} is the variable of interest, namely, the job level, compensation or switch to a new employer, α_i are individual fixed effects, λ_t are year effects (relative to the liquidation year, defined as $t = 0$), and $L_{it}^k = L_i \times \mathbf{1}(t = k)$ are a set of 11 dummies, each equals to 1 k periods before or after the liquidation if individual i experiences it ($L_i = 1$), and 0 otherwise.

We normalize the value δ_{-1} to 0 in order to identify the sequence of δ_k, which can be interpreted as the change in outcome (e.g., job level) from the year before the event to k periods after (or before) by comparison with individuals who did not experience a fund liquidation. Our empirical strategy requires the absence of trend in the outcome variable before the liquidation event. If this assumption holds, then δ_k should be approximately zero for $k < 0$, and any effects of the liquidation should emerge as estimates of δ_k significantly different from zero for $k \geq 0$.

We use career data for five years before and after the liquidation event, to make sure that the endpoints of the leads and lags are not a mixture of further leads and lags. Since it has been shown that talented workers tend to leave their companies when these approach bankruptcy (Baghai et al., 2017), we count as affected employees all those who were employed in the relevant fund in a two-year window prior to the event. This avoids the selection bias that could be induced by considering only those still working at the fund when it is wound up.

The resulting estimates are shown in Figure 7 (job level), Figure 8 (compensation) and Figure 9 (employer switches) for an interval of 11 years centered on the liquidation year. Each figure shows the paths of these three outcomes for the liquidated and control groups (upper panel) and the corresponding differences (i.e., the estimated δ_k) with their 95% confidence intervals (lower panel). None of the three outcome variables shows any significant pre-liquidation trend, that is, the coefficients δ_k are not significantly different from zero for $k < 0$, as our empirical strategy requires; but they are significantly different from zero afterwards.

[Insert Figures 7, 8 and 9]

In particular, both the job level and compensation decline significantly after the liquidation, without noticeable reversion to their pre-liquidation level. The job level

drops by 0.2 notches in the two years after liquidation and remains at this lower level for the next three years. The behavior of compensation is similar: by the second year after liquidation, it drops about $200,000 below the pre-liquidation level, and stays there in the subsequent three years. On the whole, Figures 7 and 8 suggest that individuals working for liquidated funds suffer a significant and durable career slowdown.[14]

The post-liquidation career slowdown is accompanied by increased probability of switching employers. For employees with jobs in more than a single company, a switch occurs when any of the employers changes. However, moving to a different fund managed by the same parent company does not count as a switch (the employment relationship is at company and not fund level). The probability of switching, i.e. job mobility, rises by 10 percentage points in the year after the liquidation, as shown by Figure 9). The figure also shows that, prior to the liquidation date, the managers of the funds that are later liquidated are no more likely to switch employer than those in the control group. This is consistent with the idea that it is the liquidation that triggers mobility, not managerial turnover (due, say, to resignations) that triggers liquidations.[15]

In Figures 7, 8 and 9, the estimate of the effect of liquidation at each date (each δ_k) is based on a different sample, because sample composition changes over time. For example, asset managers whose funds are liquidated early in their careers are not observed several years prior to the event, and those who experience liquidation at the end of the career are not observed several years after. To allay this concern, as a robustness check, we also estimate equation (12) using a balanced sample of managers of liquidated funds and matched controls, i.e. manager pairs that are observed for all the eleven years surrounding liquidation. The results (not reported for brevity) are very similar to those shown in the above figures.

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[14]In unreported regressions, we test whether careers feature a significant slowdown when individuals face for the first time a fund termination occurring for reasons other than liquidation, specifically because, according to TASS, the fund is merged into another entity, is closed to new investment, becomes dormant or has its program closed. We find no significant changes in the career paths of professionals following these events. The scarring effects documented here are thus associated with liquidations, and not merely with the fund being dropped from the database of live funds.

[15]This test is possible only because the managers of the liquidated funds include all those who worked for those funds at any time during the two years prior to the event: if we had required them to work for those funds up to the year of the event, then by construction they could not have switched to a new employer beforehand.

5.1.1 Are scarring effects more severe for high-ranking employees?

One may expect these scarring effects to vary significantly among asset managers depending on their characteristics: for instance, better educated or more experienced managers may suffer a smaller loss of reputation and find another job more easily. However, this is not the case for most of the individual characteristics we consider: post-liquidation career outcomes do not differ significantly by educational quality, work experience or gender.

The only characteristic that does significantly affect the existence and the magnitude of scarring effects is previous job level. Specifically, high-ranking employees are hurt more severely than others following a liquidation, as is shown by repeating the analysis separately for two groups: individuals with high positions (job levels 5 and 6), and those with medium-level jobs (levels 3 and 4) prior to the liquidation. The classification is based on the position held two years before the liquidation (not the year immediately preceding) in order to test for possible anticipated effects of the liquidation on job levels. Also in this case, we use observations for 11 years centered on the liquidation year, both for the employees of liquidated funds and for the control sample.

The top panel of Figure 10 displays the job level paths for high-ranking employees of liquidated funds and for the respective control group. The two groups advance at the same pace towards top jobs (level 6) before the liquidation, but diverge afterwards: the employees of the liquidated funds gradually lose 0.4 notches over the subsequent five years, the control group less than 0.2. The middle panel, by contrast, shows that mid-level employees keep advancing in their career paths after liquidation, albeit at a slightly slower pace than employees in the control sample. The bottom panel shows that the differences between the post-liquidation career paths of high and mid-level employees relative to their respective controls (i.e. the differences in their estimated δ_k) are significantly different from zero in the first two years after liquidation. While the two top panels show how job levels change differentially for employees starting from a given level, the bottom panel shows the difference between the effect of liquidation for employees starting from top and mid-level jobs, as well as the corresponding 95% confidence intervals.

[Insert Figure 10]

The behavior of the compensation of the two groups of employees differs even more markedly (Figure 11). After liquidation, high-ranking employees face a much sharper

cut in compensation than their control group, while mid-level employees experience no decline relative to their peers in non-liquidated funds. The difference-in-difference between high-ranking and mid-level employees is about $500,000 after 5 years, and statistically significant at the 5% level.

[Insert Figure 11]

Job mobility also increases substantially after liquidations only for high-ranking employees (Figure 12). For them, the probability of switching to a new employer increases by 10 percent more than for mid-level employees in the year after the liquidation.

[Insert Figure 12]

The fall in the post-liquidation job level implied by our estimates for top-level employees may seem less striking than that documented for executives after bankruptcy by Eckbo et al. (2016): only one third of their sample of executives retain CEO status after bankruptcy, while in our sample 71% of level-6 professionals retain this level in the subsequent 5 years. This difference may be simply because hedge fund liquidations are far less traumatic than firm bankruptcies: investment companies typically manage a family of hedge funds, and therefore generally stay in business even after winding up a fund. Hence top-level professionals working for a liquidated fund can retain their rank within the same company, working for another of its remaining funds. Indeed, the effects of liquidations on top-level professionals differ markedly depending on the number of funds that their investment company operates: five years after liquidation, 84% of level-6 professionals retain their job level if they were employed by an investment company with a number of funds above the median, against 65% at companies with below-median number of funds (the median being 5).

The drop in compensation of high-ranking managers also differs between these two types of investment companies: Figure 13 shows the average compensation for level 5-6 professionals at liquidated funds, separately for companies with above- and below-median numbers of funds. The average post-liquidation loss is about $500,000 less for managers employed by investment companies with more funds, and this difference is statistically significant. These results are consistent with the idea that multi-fund investment companies tend to retain valuable top-level employees, because the liquidation of one of the funds is less likely to be associated with the demise of the company.

[Insert Figure 13]

5.1.2 Other outcomes of liquidation

In principle, the liquidation of a hedge fund may be associated with even more drastic career outcomes than demotion in the corporate hierarchy or a pay cut. It could mean the exit from asset management or from the finance industry altogether. We investigate whether this is the case in the regressions shown in columns 1 and 2 of Table 6, where the dependent variable is a dummy equal to 1 if an individual works in asset management or in the finance industry, and 0 otherwise. The other regressions in Table 6 investigate two other outcomes of fund liquidations, namely the observed frequency of being a founder and the number of employment positions held.

[Insert Table 6]

All the regressions in Table 6 are estimated separately for top- and medium-level employees, given the foregoing evidence that fund liquidations are associated with different career outcomes for the two groups. And in fact for these other outcomes too there are no statistically significant effects for mid-level employees, whereas for those starting from top-level positions the probability of remaining in asset management in the five years after liquidation is 5 percentage points lower than for their peers not exposed to liquidation (column 1), although their probability of exiting the finance industry altogether is not significantly greater (column 2).

The probability of being the founder of a company drops by 5 percentage points for top-level employees after a fund liquidation, suggesting that liquidation may depress entrepreneurship, possibly for reputational reasons (column 3). Finally, liquidation does not appear to be significantly associated with change in number of employment positions, i.e. companies with which an individual is associated.

Three years after the liquidation, 86% of the employees associated with liquidated funds are still in asset management. Of those leaving asset management, 55% end up outside finance altogether, 27% in commercial banking, 11% in "other finance" (mainly financial advising), 4% in financial conglomerates, and 3% in insurance.

5.2 Causes of Scarring Effects

The main result of the previous section is that hedge fund liquidations entail significant and persistent scarring effects, mainly on high-ranking managers. In itself this finding does not help us to discriminate between the "market discipline" and the "career risk" hypotheses. One could argue that, given their decision-making power,

high-ranking employees are subject to the greatest reputation loss. But they also are likely to be those with the most human capital at stake: they may have developed portfolio strategies, client relationships and work habits that cannot be easily transplanted to a new job, possibly outside the hedge fund industry or even the finance industry altogether. Hence, they may stand to lose more than lower-ranking employees. Thus the absence of a scarring effect for mid-level professionals is not sufficient evidence against the "career risk" hypothesis.

To discriminate between the two hypotheses, we explore whether the impact varies with the fund's relative performance prior to liquidation. According to the model in Section 2, a fund liquidation should tarnish the reputation of its managers only if it follows poor relative performance, and even then only if such underperformance is sufficiently persistent as to be informative of the managers' skill, rather than a chance unlucky draw. The "career risk" hypothesis, instead, predicts that a liquidation may affect fund managers' subsequent careers in fortuitous circumstances as well, such as adverse sector or market-wide trends: if the parameter $\phi > 0$, also in such circumstances employees of liquidated funds may face a decline in earnings, as they are less productive in their new jobs. In the former scenario, liquidations reflect, at least partly, a re-assessment of a manager's skill; in the second they simply result from bad luck.

To test whether relative performance before liquidation affects post-liquidation career slowdowns, we estimate the following variant of equation (12):

$$y_{it} = \alpha_i + \lambda_{gt} + \gamma L_{it}^{post} + \delta L_{it}^{post} \times P_{it}^- + \epsilon_{it}, \tag{13}$$

where L_{it}^{post} is a liquidation dummy equal to 1 in the five years after liquidation and 0 otherwise, and P_{it}^- is a "poor performance" indicator, i.e. a dummy equal to 1 if the liquidation follows a period (alternatively, 1 year or 2 years) in which the fund's average monthly return fell short of its benchmark. Equation (13) also includes individual fixed effects, α_i, and separate time effects for the two subsamples of control employees, λ_{gt}, where $g = 1$ for the control individuals matched with the employees of under-performing liquidated funds and $g = 2$ for those matched with employees of well-performing funds.

The coefficient γ measures the effect on career outcomes when liquidation is preceded by normal relative performance; δ captures the incremental effect of poor performance. A negative estimate of γ in equation (13) would imply that $\phi > 0$ in

the model of Section 2, namely, that also fortuitous liquidations have scarring effects, while a zero estimate of γ indicates that such liquidations have no scarring effects, i.e., $\phi = 0$ in the model. The estimate of δ instead measures the career slowdown due to reputation loss from liquidation, which, as suggested by the model, should be only present if the liquidation is preceded by underperformance for a sufficiently long period (the optimal waiting time t^*).

The resulting estimates are shown in columns 1, 2 and 3 of Table 7 for the job level, compensation and job mobility. What varies between the two panels is the time interval over which performance is measured. The rationale for measuring pre-liquidation performance over various time intervals is that its informativeness about the managers' quality should be greater for longer periods, as high-frequency noise in returns gradually abates. In the top panel, performance is measured over the year before liquidation; in the bottom panel, over two years. The estimates of the coefficient γ are small and not significantly different from zero for job level and compensation (columns 1 and 2), regardless of the length of the period chosen; hence, when prior performance is good, liquidation has no scarring effect, i.e. the parameter $\phi = 0$ in the model. By contrast, the estimates of the coefficient δ in these two regressions rise in absolute value between Panel A and Panel B, and in the latter they become significantly different from zero. This indicates that, as time-averaging increases the signal-to-noise ratio in data on pre-liquidation returns, the scarring effect of liquidation following underperformance are both greater and more precisely estimated, consistent with the market discipline hypothesis. When a liquidation is preceded by two years of underperformance, it triggers a job level drop of 0.35 notches larger than if the liquidation were preceded by normal performance, and a compensation loss over \$420,000 larger.

[**Insert Table 7**]

By contrast, the effects of liquidation on job mobility do not appear to vary with pre-performance: column 3 indicates that liquidation is followed by an increase of 5 to 6 percentage points in the probability of switching to a new employer, with no significant difference when liquidation is preceded by underperformance. Even liquidations that imply no information regarding the affected employees, presumably induce some employees to switch to other companies for more suitable jobs. By the same token, the employees affected by liquidations preceded by poor performance (and by the associated reputation loss) have an equal probability of switching to a

new employer, but suffer a career slowdown. This squares with the idea that the setback does not stem simply from the frictions associated with changing jobs.

To further corroborate the hypothesis that the scarring effects documented above are induced by reputation loss due to fund-specific underperformance rather than by market-wide trends, we estimate an expanded specification of equation (13) (not shown for brevity) that also includes an interaction of the liquidation dummy with absolute previous returns (more precisely, with a dummy equal to 1 if liquidation follows 2 years of negative average returns). The estimated coefficient of this further interaction is not significantly different from zero, whereas all the other coefficient estimates are very close to those reported in Table 7. So it is relative, not absolute, pre-liquidation performance that triggers scarring effects.

Since the previous subsection shows that only high-ranking managers suffer significant career slowdowns after liquidations, it is worth investigating whether this happens only in the wake of persistent pre-liquidation underperformance. This provides a sharper test of the thesis that the career slowdown arises from reputation loss among top executives. To implement this test, we re-estimate equation (13) separately for high- and mid-ranking employees. The results are reported in Table 8.

[**Insert Table 8**]

In our estimates, only high-ranking employees (those with level-5 or level-6 jobs two years before liquidation) whose funds were liquidated after underperforming their benchmarks for two years suffer a post-liquidation career slowdown. Panel A of Table 8 reports the estimates for high-ranking employees, Panel B reports those for mid-level employees (level-3 or level-4) two years before the liquidation. Columns 1, 2 and 3 show the results for the job level, compensation and mobility.

Liquidations after normal performance are not followed by significant change in either the job level or compensation of top employees, but those that come after persistent underperformance do have significant scarring effects. The interaction between liquidation and poor performance has a negative and significant coefficient in both the job level and compensation regressions: the job level drops by 0.44 notches and compensation by $664,000 more than for top employees of funds that are liquidated in the wake of normal performance. In our sample, liquidations after poor relative performance are the most common ones: 79% of the liquidated hedge funds performed worse than their benchmark in the previous two years.[16] However,

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[16]Brown et al. (2001) also find that poor relative performance increases the probability of hedge

the job mobility of top employees increases after liquidation regardless of the fund's previous performance: the probability of switching increases by 4 percentage points in the years following liquidations even of well-performing funds (though this coefficient is not precisely estimated).

To sum up, the scarring effects of liquidations preceded by poor performance are very large for high-ranking employees, but no significant effects are observable for mid-level employees. The evidence, then, is consistent with the idea that liquidations cause a career slowdown for managers who can be held responsible for their fund's poor performance. This squares with the thesis that the scarring effects depend mostly on reputation loss, not the materialization of "career risk". According to our model, therefore, such effects can be thought of as the source of "market discipline", which serves as an incentive to fund managers over and above performance-based pay. Since fortuitous liquidations are estimated to have no scarring effects ($\phi = 0$), our model suggests that the disciplining role of performance-driven liquidations is not diluted by career risk arising irrespective of performance.

6   Conclusions

We have found that, if finance professionals experience a great career acceleration upon entering the hedge fund industry, they also face significant setbacks and are more likely to switch to other employers following the liquidation of the fund they work for.

This "scarring effect" impinges only on high-ranking managers in the investment companies, and only on those whose funds significantly and persistently underperform their benchmarks. Top managers of funds wound up after two years of poor relative performance suffer job demotion and a sizable compensation loss. Instead, when it is preceded by normal performance, fund liquidation is not associated with career slowdown or significant compensation loss.

We interpret these findings using a model of asset managers' careers featuring moral hazard and adverse selection, where the fund's relative performance enables investors to gradually learn about managers' skills, and both performance pay and the danger of liquidation play a disciplining role for managers. Liquidation may also have causes that are not performance-related, in which case they entail only

fund termination.

career risk, and do not generate incentive effects – indeed, the frequency of such liquidations weakens the disciplining role of performance-related liquidations. In this framework, our empirical findings that performance-related liquidations are by far the most common, and that they are the only ones followed by substantial and persistent scarring effects, suggest that they play a strong disciplining role *ex ante*.

On the whole, our results reveal a new facet of market discipline in asset management, operating via the managerial labor market. This labor market discipline is complementary to contractual incentives within the firm. The job market "stick" may indeed be a corrective to the tendency to motivate asset managers by generous "carrots", i.e. performance-based remuneration that is far more sensitive to upside gain than to downside risk.

Appendix: The Sector Imputation Algorithm

As is explained in the text, after manual identification of the sector of 2,129 employers ("classified companies"), we impute the sectors of the remaining 4,642 employers ("unclassified companies") via a machine-learning algorithm. The algorithm exploits the association between job titles and sectors in the subsample of classified companies to assign unclassified companies to their respective sectors: it determines whether an unclassified company's jobs are typical of a certain sector, based on their prevalence in companies already classified as belonging to that sector.

The algorithm must perform three main tasks:

- represent job descriptions in such a way that they can be processed with learning algorithms;

- aggregate the information on job descriptions in order to define broader general tasks;

- associate these broader tasks with sectors and use them to sort the unclassified companies into the sectors.

To overcome these difficulties, we proceed in five steps:

1. **Construct a vocabulary of job descriptions.** To this end, we adopt *term frequency-inverse document frequency* (*tf-idf*) method, a statistic reflecting the importance of a word in a document forming part of a collection of documents. This statistic increases in proportion to the number of times a word appears in the document, with a penalty for the frequency of the word in the collection of documents, so as to adjust for the fact that some words appear more frequently in general.

2. **Express job descriptions as vectors.** The *tf-idf* vectorization results in a matrix in which each row is a vector in $[0, 1]^p$ representing a job description (p being the number of words in the vocabulary) and every column is the set of values of the *tf-idf* statistic measuring the prevalence of a given word across all job descriptions. Since this matrix is very large and sparse, in order to reduce its dimensionality without losing relevant information, we use a truncated singular value decomposition of the *tf-idf* matrix, known as *Latent Semantic Analysis*, which is very similar in spirit to *Principal Component Analysis*. The end result is a matrix with 200 columns and a number of rows equal to the number of job descriptions.

3. **Aggregate job descriptions into broader tasks.** The large number of different job descriptions necessitates the aggregation of similar ones into broader tasks, choosing their breadth optimally to learn the type of tasks performed in each sector. We use a clustering algorithm to identify clusters of similar jobs, and represent each job description in the original dataset by its cluster. To cluster the jobs we apply the *k-mean* algorithm to the matrix constructed in step 2. Based on tuning, the number of clusters is set to 200.

4. **Aggregate the information by company.** We use a supervised learning algorithm to associate the broad tasks (clusters) obtained in step 3 with sectors. To do this, the data are reshaped into a matrix where each row is uniquely identified by a company name and each column refers to one of the 200 broader tasks identified in step 3. Each element of the matrix is an integer that counts the number of employees performing a specific task in a given company.

5. **Sort the unclassified companies into their sectors.** This task is performed with a *Neural Network* with one hidden layer of 110 nodes (obtained by tuning). The input is the matrix obtained in step 4 to which a further column is appended, whose elements are the number of employees in each company. We train the *Neural Network* using the classified companies to predict the sector of the unclassified ones.

These five steps form a single iteration of the entire code used to sort the unclassified companies into the six sectors. At each iteration, for each unclassified company the *Neural Network* generates a list of probabilities for the possible sector classification. In each round, we classify within a sector only the companies whose predicted probability of belonging to that sector exceeds some threshold (75% in the first iteration). That is, each round classifies only a portion of the unclassified companies. We use this augmented dataset as the starting point for a new implementation of the entire procedure. Eventually we classify all the companies, with an average cross-validation error of 20%.[17]

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[17]The threshold is gradually lowered at successive iterations and is removed in the very last one (where we classify into the sector with the highest probability); cross-validation is computed on 10% of the data at every iteration before the classification; the total number of iterations is 30; all the code is written in Python 3 and uses the *scikit-learn* package (Pedregosa et al., 2011).

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Table 1: Job Levels and Compensation

This table illustrates the two dimensions that characterize the employment positions of the individuals in our sample: their job level, i.e. rank within the corporate hierarchy, and the typical compensation associated with that title and sector. Job levels are identified by first matching the job titles reported by individuals in their resumes with the Standard Occupational Classification (SOC) produced by the Bureau of Labor Statistics (BLS), and then grouping the SOC codes into six bins reflecting different degrees of decision-making power. To measure the average annual compensation associated in 2016 with each SOC code, for level 1-4 jobs we use the Occupational Employment Statistics (OES), allowing for differences in salary across the following six sectors: (i) asset management (AM), (ii) commercial banking and other lending institutions (CB); (iii) financial conglomerates, defined as institutions encompassing lending, insurance and/or asset management (CO); (iv) insurance (IN); (v) other finance, which consists mainly in financial consultancies and portfolio advisors (OF); and non-financial firms and institutions, including government, supranational institutions and stock exchanges (NF). For levels 5 and 6, we use data on total compensation (including the variable component) drawn from the 10K forms filed with the SEC in 2015by companies belonging to the six sectors.

Job Level	Description	Average Compensation	Examples of job titles
6	CEOs	3,707,831	CEO, executive director, founder, managing director, managing partner
5	Top executives	1,590,858	CFO, CIO, COO, CRO, deputy CEO, partner, vicepresident
4	First/Mid Officers & Managers	158,150	director of sales, head of investor relations, investment manager
3	Professionals	105,694	analyst, portfolio manager
2	Technicians, Sales Workers, Administrative Support Workers	101,851	trader, credit officer
1	Craft Workers, Operatives, Labors & Helpers, Service Workers	53,845	assistant, intern

Table 2: Descriptive Statistics

The table reports statistics on the characteristics of the individuals in our sample, based on data drawn from individual resumes available on a major professional networking website, together with information available from Bloomberg, Businessweek and companies websites. Education Level variables are indicators for the highest degree held. Subject variables designate the subject of the highest degree. The quality of highest degree is defined on the basis of QS Ranking, with three indicators depending on whether the university of the highest degree ranks in the top 15, 16th to 40th, or below 40th. Cohort dummies are defined by the starting date of the first job reported in the resume. Sector variables are dummies equal to 1 if the job is in that sector, and 0 otherwise. AM stands for asset management, CB for commercial banking and other lending institutions, CO for financial conglomerates, IN for insurance, OF for other financial companies and NF for non-finance companies. The job level reflects different degrees of decision making-power and takes values from 1 (bottom of the hierarchy) to 6 (CEO). For levels 1-4, compensation is the average annual salary associated in 2016 with each SOC code in these sectors; for levels 5-6, it is the total compensation reported in the 10K forms filed with the SEC in 2015 by companies belonging to the same six sectors. Level-6 Position is a dummy variable indicating whether an individual holds a level-6 position (=1) or not (=0). Company Switch is an indicator for whether at time reports working for a different company from the previous year. For some variables, fractional shares do not sum to 1 due to missing observations.

	Obs.	Mean	Median	St. Dev.
Education Level				
High school	1948	0.00	0	0.05
College	1948	0.39	0	0.49
Master	1948	0.41	0	0.49
JD or PhD	1948	0.03	0	0.18
Subject of highest degree				
Econ or Finance	1948	0.59	1	0.49
Science or Engineering	1948	0.08	0	0.27
Quality of highest degree institution				
Ranked top 15	1948	0.16	0	0.37
Ranked 16-40	1948	0.06	0	0.24
Ranked below 40	1948	0.44	0	0.50
Cohort				
1962-1979	1948	0.04	0	0.20
1980-1989	1948	0.22	0	0.41
1990-1999	1948	0.46	0	0.50
2000-2013	1948	0.28	0	0.45
Male	1889	0.83	1	0.37

	Obs.	Mean	Median	St. Dev.
Sector				
AM	42027	0.75	1	0.43
CB	42027	0.06	0	0.23
CO	42027	0.01	0	0.09
IN	42027	0.01	0	0.10
NF	42027	0.15	0	0.36
OF	42027	0.02	0	0.15
Career variables				
Job level	41775	4.42	4	1.41
Compensation ($ thou)	40558	1,582	221	1,639
Level-6 Position	42339	0.33	0	0.47
Switch company	42339	0.13	0	0.34

Table 3: Fund Descriptive Statistics

The table presents summary statistics for the monthly returns of hedge funds in the TASS database and in our sample. All statistics are in percent, and are broken down by fund classes following the TASS classification into six classes by type of strategy (columns 1-6). Panel A refers to the entire sample of 19,367 hedge funds present in the TASS database at any time from 1978 to 2014: the first two rows show the mean and standard deviation of the monthly percentage benchmark returns (i.e. the cross-sectional average of the monthly returns of the funds in each class); the third row shows the standard deviation of funds' relative performance, defined as the difference between the monthly percentage return of a fund and its benchmark; the fourth row reports the percentage of funds in each class. Panel B refers to our own sample of 4,944 hedge funds: the first two rows report the mean and standard deviation of fund relative performances, the third row the percentage of funds in each class.

	Relative Value	Security Selection	Multi-process	Direct. Traders	Funds of Funds	Other
Panel A: TASS Database						
Mean, benchmark	0.73	1.32	1.04	1.09	0.78	1.24
St. Dev., Benchmark	1.06	3.05	2.09	3.08	2.05	4.15
St. Dev., Rel. Perf.	2.21	3.62	2.24	4.37	1.73	4.23
Fraction of Funds	5.33	27.50	19.53	10.69	28.98	7.97
Panel B: Our Sample						
Mean, Rel. Perf.	0.01	0.02	-0.10	0.03	-0.01	0.07
St. Dev., Rel. Perf.	2.22	3.54	2.37	4.16	1.58	3.81
Fraction of Funds	6.92	34.42	15.51	10.82	24.51	7.81

Table 4: Change in Job Level upon Hiring

The table reports the estimated relationship between changes in job level upon hiring and the characteristics of individuals and hedge funds. Job Level ranges from 1 (bottom of the hierarchy) to 6 (CEO). Education Quality is a dummy equal to 1 if the individual has a graduate degree from an institution ranked in the top 15 universities according to QS and 0 otherwise. Experience is the level of experience of the individual at the time of hiring. Exp. in AM is the number of years of work experience in asset management before being hired by a hedge fund company. Female is a dummy equal to 1 for women and 0 for men. Past Performance is the average difference between fund j's percentage return and its benchmark in the three years before hiring, and Past Benchmark is the average percentage return of all the funds in j's class in the three years before hiring. Log(AUM) is the logarithm of lagged average assets under management of fund j. Fund Style is a set of six dummies capturing the funds investment style, and cohort fixed effects correspond to people who entered the labor market either before 1990, between 1990 and 2000, or after 2000. Robust standard errors are shown in parentheses below the respective coefficients: * denotes $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Dependent variable: Job Level upon hiring			
	(1)	(2)	(3)	(4)
Education quality	0.320***	0.402***	0.300**	0.251*
	(0.090)	(0.148)	(0.145)	(0.144)
Experience	0.017***	0.026***	0.020**	-0.006
	(0.006)	(0.008)	(0.008)	(0.011)
Exp. in AM	0.025***	0.024**	0.029***	0.030***
	(0.007)	(0.010)	(0.010)	(0.010)
Female	-0.731***	-0.512***	-0.520***	-0.508***
	(0.074)	(0.101)	(0.105)	(0.105)
Previous Job Level	0.117***	0.130***	0.134***	0.128***
	(0.018)	(0.027)	(0.028)	(0.029)
Past Performance		0.090***	0.063**	0.058**
		(0.025)	(0.024)	(0.024)
Past Benchmark		0.122	0.075	-0.020
		(0.078)	(0.076)	(0.074)
log(AUM)			0.005	0.005
			(0.026)	(0.026)
Constant	3.990***	3.554***	4.251***	4.545***
	(0.060)	(0.124)	(0.517)	(0.515)
Cohort FEs	No	No	No	Yes
Fund Style	No	No	Yes	Yes
Observations	1936	779	720	720

Table 5: Change in Compensation upon Hiring

The table reports the estimated relationship between changes in compensation upon hiring and the characteristics of individuals and hedge funds. Education Quality is a dummy equal to 1 if the individual has a graduate degree from an institution ranked in the top 15 universities according to QS and 0 otherwise. Experience is the level of experience of the individual at the time of hiring. Exp. in AM is the number of years of work experience in asset management before being hired by a hedge fund company. Female is a dummy equal to 1 for women and 0 for men. Past Performance is the average difference between fund j's percentage return and its benchmark in the three years before hiring, and Past Benchmark is the average percentage return of all the funds in j's class in the three years before hiring. Log(AUM) is the logarithm of lagged average assets under management of fund j. Fund Style is a set of six dummies capturing the fund's investment style, and cohort fixed effects correspond to people who entered the labor market either before 1990, between 1990 and 2000, or after 2000. Robust standard errors are shown in parentheses below the respective coefficients: * denotes $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Dependent variable: Compensation upon hiring, in thousands of USD			
	(1)	(2)	(3)	(4)
Education quality	306.030***	285.250	171.269	121.665
	(118.122)	(203.333)	(200.284)	(200.609)
Experience	15.433**	23.979**	19.330*	-5.401
	(6.764)	(9.618)	(10.097)	(13.055)
Exp. in AM	23.712**	27.274**	34.403**	36.030***
	(9.476)	(12.838)	(13.472)	(13.618)
Lagged Compens.	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Female	-800.309***	-592.172***	-603.455***	-588.781***
	(76.738)	(103.821)	(108.377)	(108.075)
Past Performance		75.960**	53.033*	48.121
		(31.258)	(31.027)	(30.693)
Past Benchmark		130.133*	94.356	4.730
		(72.668)	(73.527)	(76.321)
log(AUM)			23.002	22.767
			(30.629)	(30.193)
Constant	1283.220***	831.663***	1042.022*	1326.247**
	(59.455)	(110.709)	(614.588)	(610.438)
Cohort FEs	No	No	No	Yes
Fund style dummies	No	No	Yes	Yes
Observations	1864	752	696	696

Table 6: Other Post-Liquidation Career Outcomes

The table reports estimates for the effects of liquidation on career outcomes. Liquidation is a dummy equal to 1 in the 5 years following liquidation (for funds that are liquidated), and 0 otherwise. Job in Asset Mgmt. is an indicator for working in Asset Management, Job in Non-Finance for working in a non-financial company; Being a Founder designates a company founder, and No. of Jobs is the number of companies employing the professional. Panel A reports the estimated effects of liquidation for professionals that held a level-5 or level-6 position two years prior to liquidation. Panel B reports the effects for professionals that held a level-3 or level-4 position two years prior to liquidation. The standard errors shown in parentheses are clustered at individual level: * denotes $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Job in Asset Mgmt.	Job in Non-Finance	Being a Founder	No. of Jobs
	(1)	(2)	(3)	(4)
Panel A: starting from job levels 5 and 6				
Liquidation	-0.048**	0.026	-0.045**	0.031
	(0.021)	(0.019)	(0.020)	(0.040)
Observations	3920	3920	3920	3920
No. professionals	595	595	595	595
Panel B: starting from job levels 3 and 4				
Liquidation	-0.042	0.033	-0.003	0.030
	(0.032)	(0.028)	(0.013)	(0.034)
Observations	3034	3034	3034	3034
No. professionals	465	465	465	465

Table 7: Fund Performance and Career Effects of Liquidations

The table reports estimates for the career effects of liquidations after poor relative performance. Liquidation is a dummy equal to 1 in the liquidation year and in the 5 subsequent years (for funds that are liquidated), and 0 otherwise. Poor Performance is a dummy equal to 1 for funds with average monthly return below the benchmark return in the period before liquidation, and 0 otherwise, the relevant pre-liquidation period being 1 year in Panel A and 2 years in Panel B. Columns 1, 2 and 3 show the estimated coefficients of the Liquidation dummy and of its interaction with the Poor Performance dummy. The equation is estimated using data for 5 years before and 5 years after the liquidation date. Job Level ranges from 1 (bottom) to 6 (top). Compensation is the average annual salary associated in 2016 with each SOC code in the six sectors in Table 2 for professionals in job levels 1-4; for levels 5 and 6 it is the average annual total compensation associated in the 2015 10Ks with each job level in the six sectors in Table 2. Switch indicates that in year t an individual is employed by a different company relative to year $t-1$. The standard errors shown in parentheses are clustered at individual level: * denotes $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Job Level	Compensation, thousands of USD	Switch
	(1)	(2)	(3)
	Panel A: 1 year pre-liquidation performance		
Liquidation	-0.154	-59.986	0.063***
	(0.119)	(144.281)	(0.024)
Liquidation × Poor Performance	-0.010	-157.939	-0.011
	(0.138)	(167.939)	(0.028)
	Panel B: 2 years pre-liquidation performance		
Liquidation	0.118	158.613	0.047*
	(0.123)	(159.313)	(0.028)
Liquidation × Poor Performance	-0.349**	-420.808**	0.010
	(0.141)	(179.519)	(0.032)
Observations	10687	10492	10687
No. professionals	1028	1023	1028

Table 8: Fund Performance and Career Effects
of Liquidations, by Job Level

The table reports estimates for the career effects of liquidation after poor relative performance, separately for top-level (Panel A) and mid-level employees (Panel B), respectively defined as employees with pre-liquidation job levels 5 or 6 and 3 or 4. Liquidation is a dummy equal to 1 in the liquidation year and in the 5 subsequent years (for funds that are liquidated), and 0 otherwise. Poor Performance is a dummy equal to 1 for funds with average monthly return below the benchmark return in the two years before liquidation, and 0 otherwise. Columns 1, 2 and 3 show the estimated coefficients of the Liquidation dummy and of its interaction with the Poor Performance dummy. The equation is estimated using data for 5 years before and 5 years after the liquidation date for managers whose funds were liquidated. Job Level ranges from 1 (bottom) to 6 (top). Compensation is the average annual salary associated in 2016 with each SOC code in the six sectors in Table 2 for professionals in job levels 1-4; for levels 5 and 6 it is the average annual total compensation associated in the 2015 10Ks with each job level in the six sectors in Table 2. Switch indicates that in year t an individual is employed by a different company relative to year $t-1$. The standard errors shown in parentheses are clustered at individual level: * denotes $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$.

	Job Level	Compensation, thousands of USD	Switch
	(1)	(2)	(3)
	Panel A: starting from job levels 5 and 6		
Liquidation	0.083	134.787	0.043
	(0.136)	(185.985)	(0.037)
Liquidation × Poor performance	-0.437***	-663.634***	0.032
	(0.160)	(218.858)	(0.041)
Observations	5512	5475	5512
No. professionals	524	524	524
	Panel B: starting from job levels 3 and 4		
Liquidation	0.029	109.933	0.068
	(0.194)	(243.862)	(0.044)
Liquidation × Poor performance	0.000	26.780	-0.031
	(0.219)	(271.245)	(0.051)
Observations	4238	4117	4238
No. professionals	410	406	410
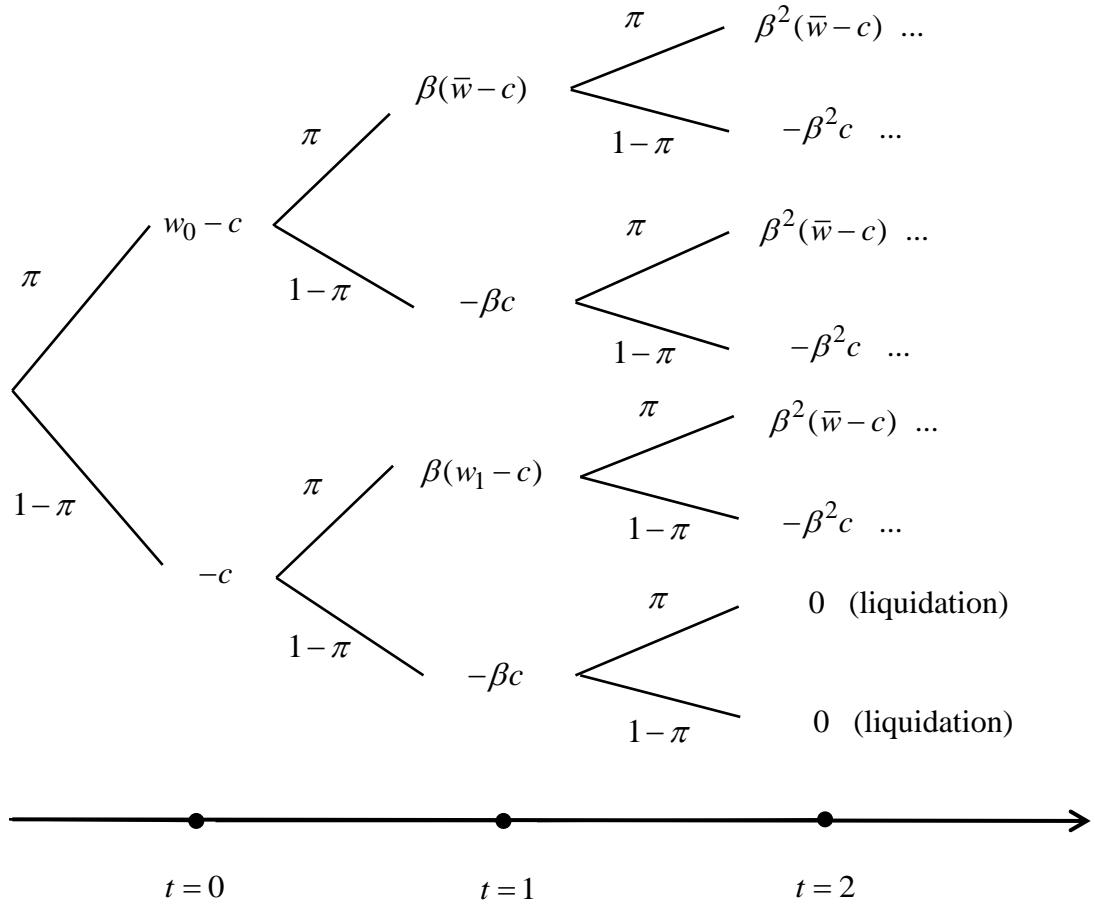
Figure 1. Managers' payoff tree with liquidation at t=2. The figure shows the payoff obtained in the first three periods by a manager who exerts effort at the private cost c. In each period, the fund's relative performance is positive with probability π and zero with probability $1 - \pi$. Accordingly, the manager receives a positive fee with probability π and zero with probability $1 - \pi$, except in case of the fund's liquidation. The assumption is that, given the model's parameters, upon low performance at $t = 0$ and $t = 1$ investors choose to liquidate the fund at $t = 2$.
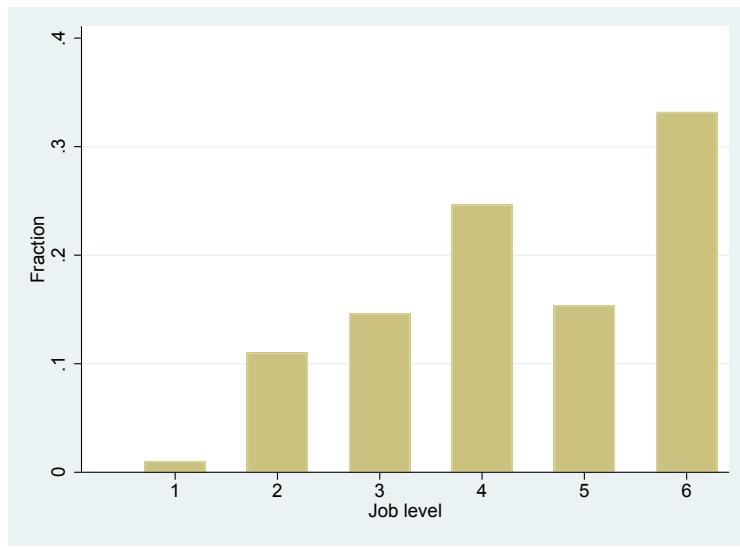
Figure 2. Distribution of Job Levels. The figure shows the distribution of job levels in our sample. Job levels are classified by first matching the job titles reported by individuals in their resumes with the Standard Occupational Classification (SOC) produced by the Bureau of Labor Statistics (BLS), and grouping the SOC codes into 6 bins, reflecting different degrees of decision-making power: 1) Craft Workers, Operatives, Laborers and Helpers, and Service Workers; 2) Technicians, Sales Workers, and Administrative Support Workers; 3) Professionals; 4) First/Mid Officers and Managers; 5) Top Executives; 6) CEOs, or other positions at the head of the corporate hierarchy.
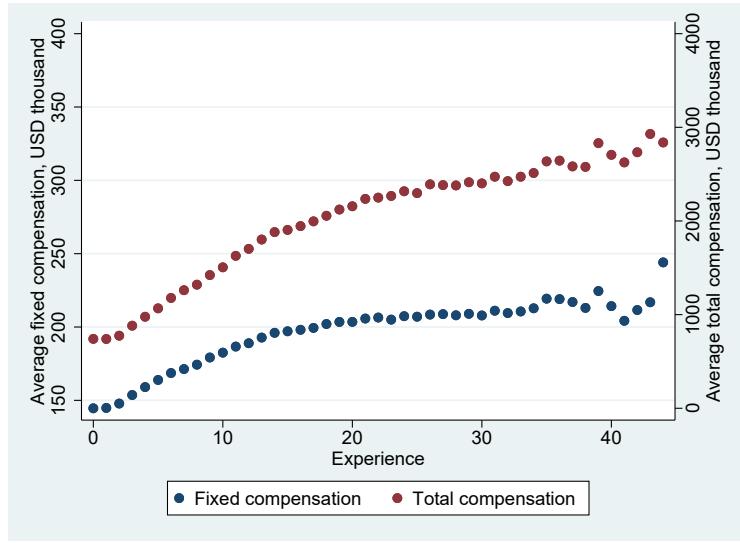
Figure 3. Career profile. The figure illustrates career paths by plotting the average fixed compensation (blue) and the average total compensation (red) against work experience for the individuals in the sample. Fixed compensation is the average annual salary in 2016 in each SOC code in the six sectors indicated in Table 2. For top executives total compensation is the average annual total compensation associated in the 2015 10Ks with each job level (5 and 6) in the six sectors of Table 2.
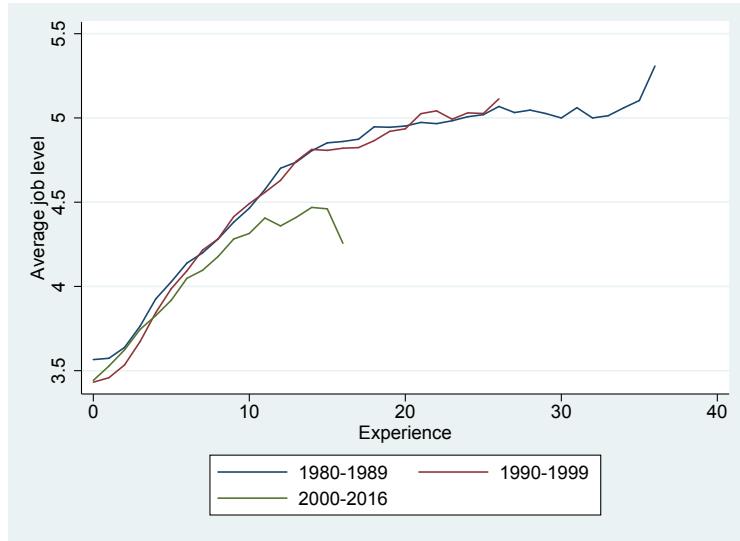
Figure 4. Career profile by cohort. The figure plots average job level against work experience by cohort of individuals. The job level reflects different degrees of decision making-power and takes values from 1 (bottom of the hierarchy) to 6 (CEO).
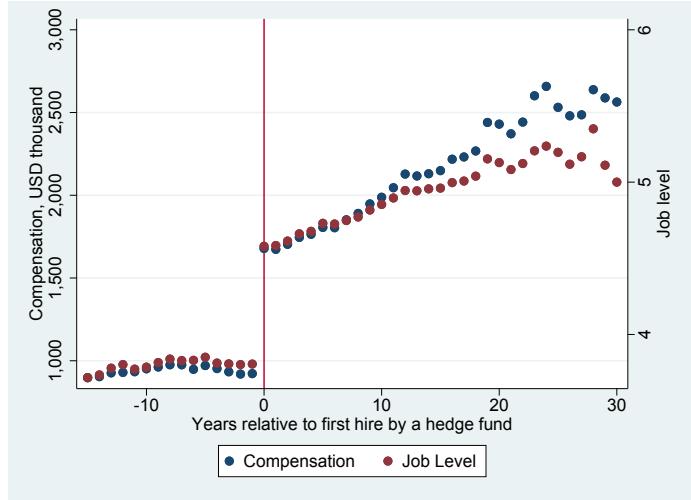
Figure 5. Entry into the hedge fund industry. The figure shows average job level (left-hand scale) and average total compensation (right-hand scale) in the fifteen years before an individual is hired by a hedge fund and the thirty years after. The job level reflects different degrees of decision making-power and takes values from 1 (bottom of the hierarchy) to 6 (CEO). For those below level 5, compensation is the average annual salary associated in 2016 with each SOC code in the six sectors listed in Table 2. For top executives (levels 5 and 6) compensation is the average annual total compensation associated in the 2015 10Ks with each job level in the six sectors of Table 2.
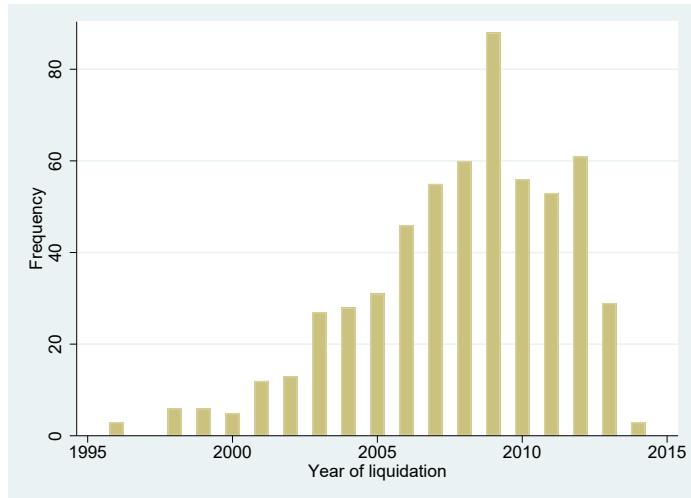
Figure 6. Histogram of hedge fund liquidations. The figure plots the histogram of the years in which individuals experience for the first time the liquidation of a hedge fund for which they work.
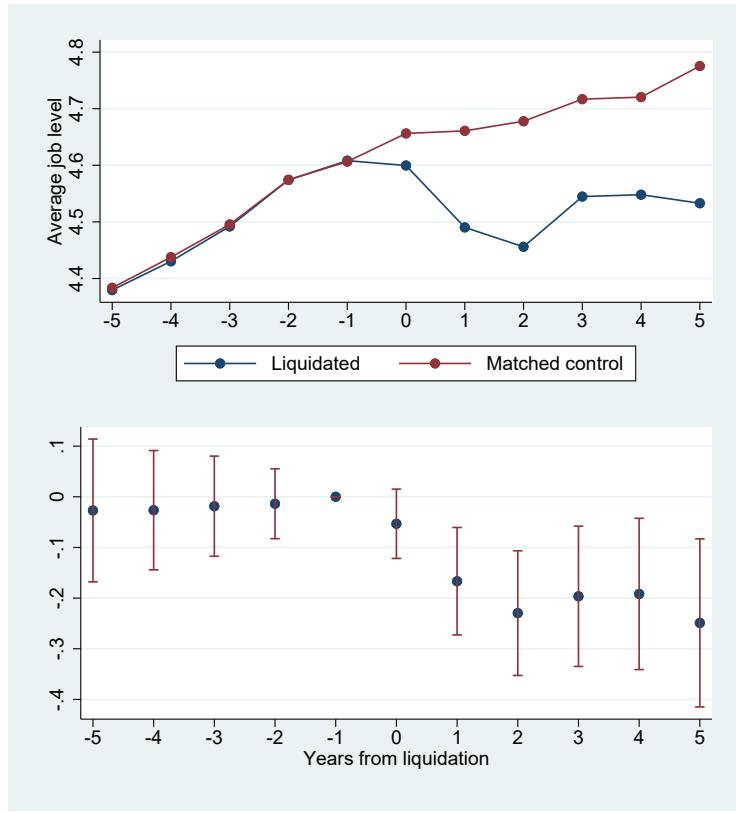
Figure 7. Career effect of liquidations. The top panel shows the average job level in the five years before and after a hedge fund liquidation, for employees of liquidated funds and for the matched control sample. Job Level reflects different degrees of decision making-power and takes values from 1 (bottom of the hierarchy) to 6 (CEO). The bottom panel of the figure shows the sequence of estimated δ_k coefficients from equation (12) when the outcome variable is job level (i.e., the coefficients of the interaction terms between having ever experienced a liquidation and indicators for time from liquidation in a model that includes time-from-liquidation and individual fixed effects) and the corresponding 95% confidence intervals.
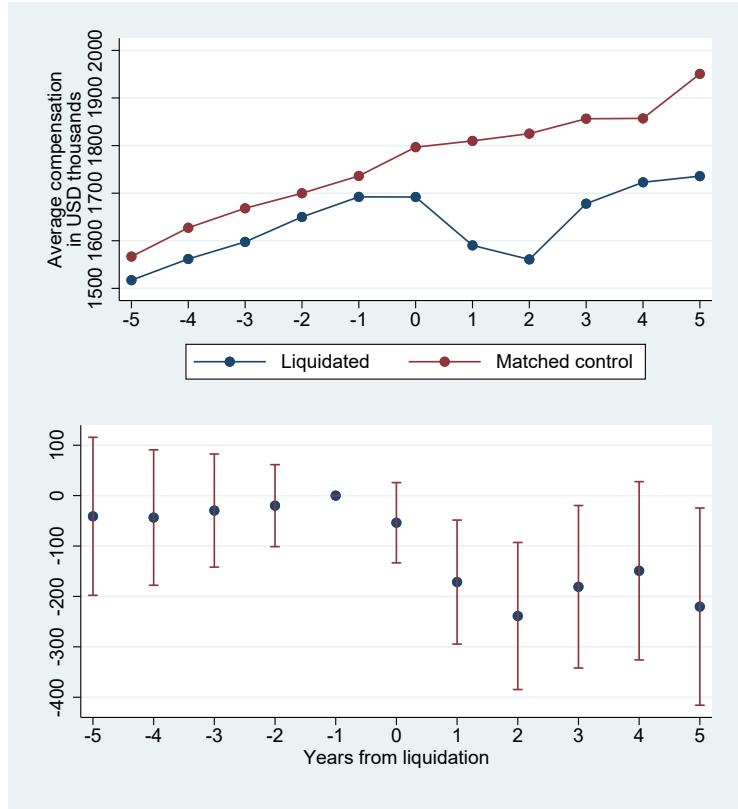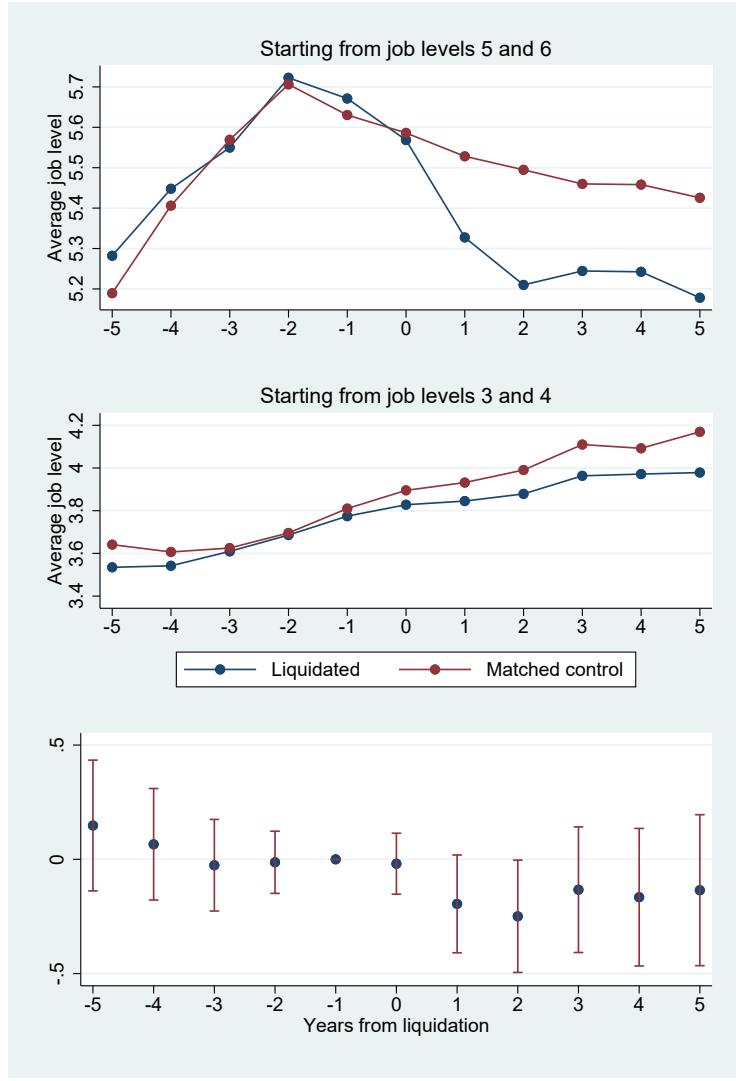
Figure 8. Compensation effect of liquidations. The top panel shows the average compensation in the five years before and after a hedge fund liquidation, for employees of liquidated funds and for the matched control sample. The bottom panel shows the sequence of estimated δ_k coefficients from equation (12) when the outcome variable is compensation (i.e., the coefficients of the interaction terms between having ever experienced a liquidation and indicators for time from liquidation in a model that includes time-from-liquidation and individual fixed effects) and the corresponding 95% confidence intervals.
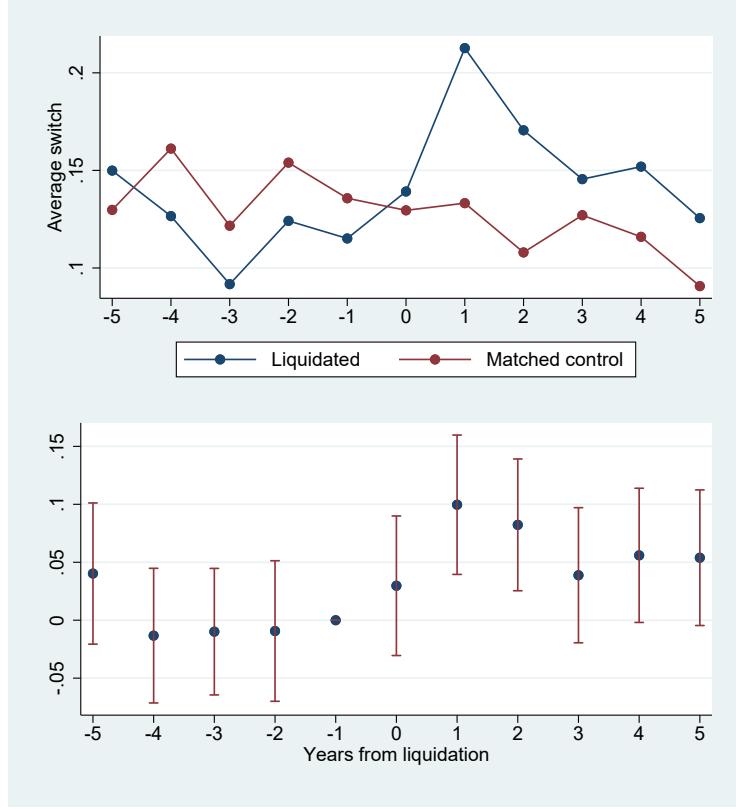
Figure 9. Mobility effect of liquidations. The top panel shows the fraction of individuals switching to a new company in the five years before and after a hedge fund liquidation, for employees of liquidated funds and for the matched control sample. Switch is equal to 1 if the employee switches to a new employer in the current year, and 0 otherwise. The bottom panel shows the sequence of estimated δ_k coefficients from equation (12) when the outcome variable is switch (i.e., the coefficients of the interaction terms between having ever experienced a liquidation and indicators for time from liquidation in a model that includes time-from-liquidation and individual fixed effects) and the corresponding 95% confidence intervals.
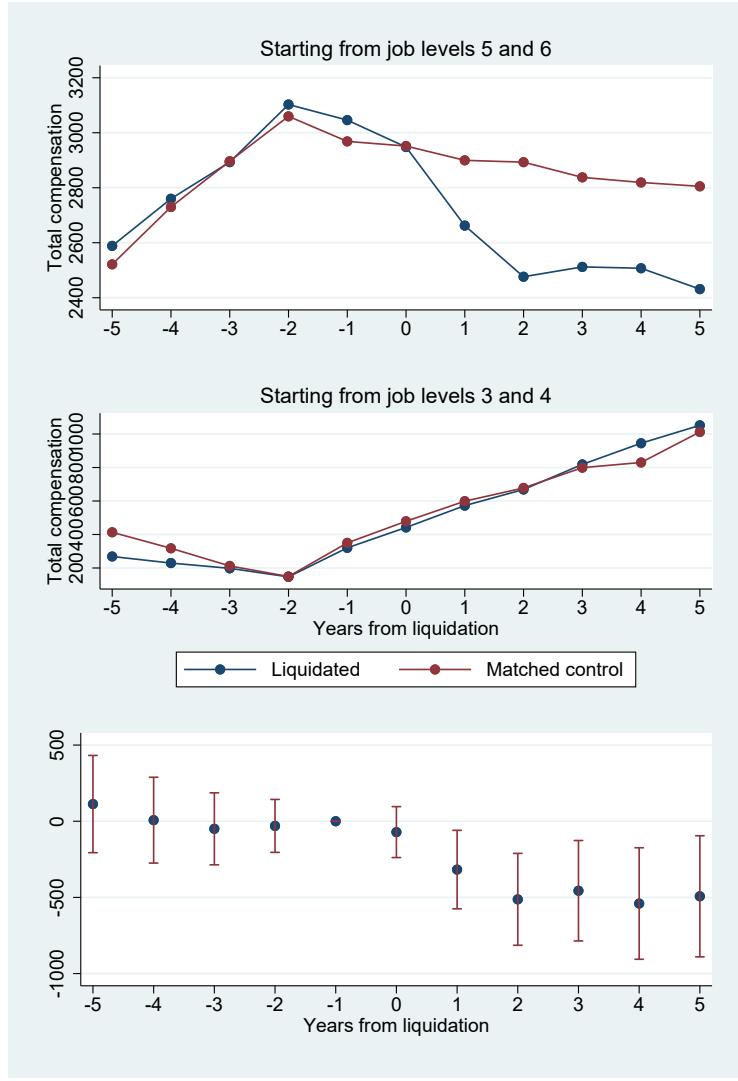
Figure 10. Career effect of liquidation by job level. The top panel shows the average job level in the five years before and after a hedge fund liquidation for employees of liquidated funds and for the matched control sample of individuals who held a top position (job level 5 or 6) two years before liquidation. The middle panel shows the average job level in the five years before and after a liquidation for employees of liquidated funds and for the matched control sample individuals who held a middle position (job level 3 or 4) two years before liquidation. The bottom panel shows the sequence of estimated coefficients of the triple interaction terms between having ever experienced a liquidation, holding a top position two years before liquidation, and indicators for time from liquidation, in a model that includes group-specific time-from-liquidation and individual fixed effects, and the corresponding 95% confidence intervals.
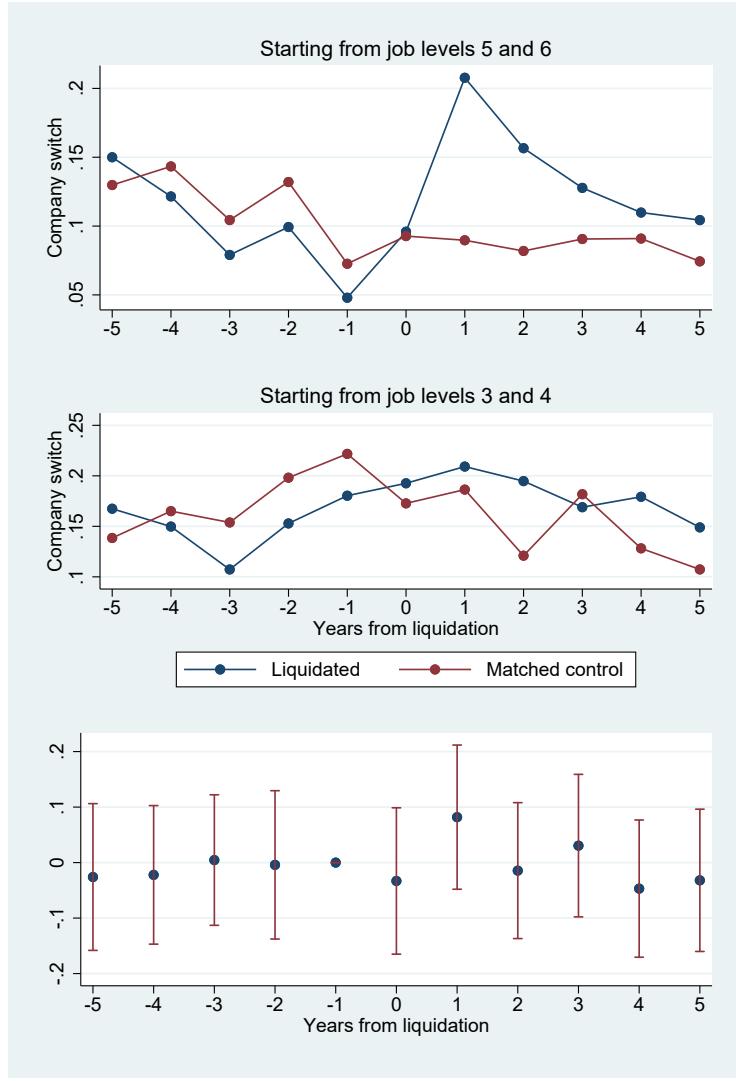
Figure 11. Compensation effect of liquidation by job level. The top panel shows the average compensation in the five years before and after a hedge fund liquidation for employees of liquidated funds and for the matched control sample of individuals who held a top position (job level 5 or 6) two years before liquidation. The middle panel shows the average compensation in the five years before and after a hedge fund liquidation for employees of liquidated funds and for the matched control sample of individuals who held a middle position (job level 3 or 4) two years before liquidation. The bottom panel shows the sequence of estimated coefficients of the triple interaction terms between having ever experienced a liquidation, holding a top position two years before liquidation, and indicators for time from liquidation, in a model that includes group-specific time-from-liquidation and individual fixed effects, and the corresponding 95% confidence intervals.
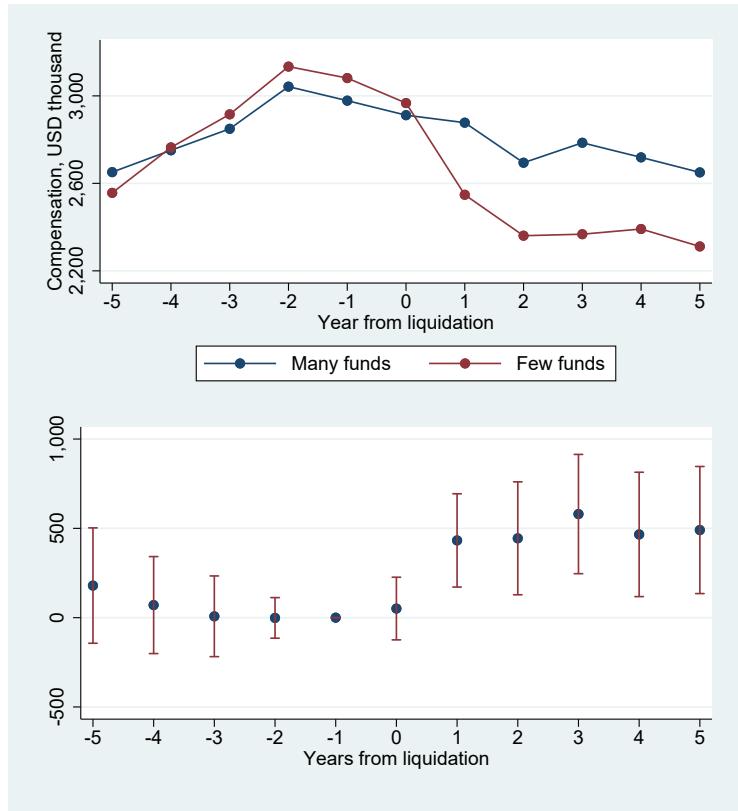
Figure 12. Mobility effect of liquidation by job level. The top panel shows the fraction of individuals moving to another company in the five years before and after a hedge fund liquidation for employees of liquidated funds and for the matched control sample of individuals who held a top position (job level 5 or 6) two years before liquidation. The middle panel shows the fraction of individuals moving to another company in the five years before and after a liquidation for employees of liquidated funds and for the matched control sample of individuals who held a middle position (job level 3 or 4) two years before liquidation. The bottom panel shows the sequence of estimated coefficients of the triple interaction terms between having ever experienced a liquidation, holding a top position two years before liquidation, and indicators for time from liquidation, in a model that includes group-specific time-from-liquidation and individual fixed effects, and the corresponding 95% confidence intervals.

Figure 13. Compensation effect of liquidation, by number of funds under management. The top panel shows the average compensation in the five years before and after a hedge fund liquidation for top executives (job level 5 or 6) of companies that manage more than the median number of hedge funds (5) and those that manage less than 5 funds. The bottom panel shows the sequence of estimated coefficients of the triple interaction between having ever experienced a liquidation, working in a company that manages more than 5 funds, and indicators for time from liquidation, in a model that includes group-specific time-from-liquidation and individual fixed effects, and the corresponding 95% confidence intervals.

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