

Team Stability and Performance: Evidence from Private Equity

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Abstract

We examine the effect of team turnover on performance studying the private equity industry. Using a unique data set that tracks over time teams in 138 PE managers and their performance, we uncover a positive relation between turnover and fund performance. We propose and confirm in the data two channels that explain our findings: i) in the short-run, performance improves when bad performers are fired, ii) in the long-run, turnover helps teams to adapt and replenish their skills in response to shifting external demand. We complement these findings showing that better PE firms fire a larger fraction of bad performing individuals, but also respond to recessions, when investment opportunities change, by updating their teams towards more operational skills. Our findings suggest that frictions coming from informational asymmetries may deter optimal turnover. These findings are surprising given the common belief among PE investors that team stability is key to long-term success.

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I Introduction

The last decades have witnessed a fundamental shift in the nature of firms in developed economies with human capital becoming a more important source of value (relative to physical capital) and a key driver of performance (Zingales, 2000; Bloom, Sadun, and Van Reenen, 2015). Retaining key talent is one of the main challenges currently grappling many organizations as talent turnover is believed to adversely affect team stability. In this paper, we empirically study the effect of team stability on performance in a team production environment.¹ As most individuals work in teams, understanding how team turnover impacts economic performance is important.

The effect of team stability on economic outcomes is ambiguous. Consistent with the implicit argument in Salop (1979), stability (or lower turnover) can induce individuals to invest in relationship specific (team specific) capital. Stability allows members of the team to get a better knowledge of the team member's abilities, which leads to an improved allocation of tasks within a team (Agrawal and Ljungqvist, 2015; Berk, Van Binsbergen, and Liu, 2014) and allows firms to keep a competitive advantage based on tacit knowledge embedded in relationships among employees (Kogut and Zander, 1996; Nahapiet and Ghoshal, 1998). However, some turnover might be optimal, especially in scenarios in which teams are operating in a changing environment that requires firms to adapt (March, 1991). A very stable team may not be able to take advantage of the new opportunities

Informational problems between various parties may also lead to stable teams even though a change in team composition might be optimal. Consider a scenario in which a cash constrained entrepreneur has to access finance from an external investor. Presence of asymmetric information between the two parties may make the entrepreneur less willing to change her team because of a signal extraction problem. Faced with an information problem if the external investors cannot decipher whether the change in team composition

¹Baron, Hannan and Burton (2001) and Shaw, Gupta, and Delery (2005) find that turnover is bad for an organization, while Glebbeek and Bax (2004) find that the relationship with performance has an inverted U shape.

reflects on the entrepreneur's ability or the changing external conditions, this would make the entrepreneur more reluctant to alter her team. Given the theoretical ambiguity, the effect of team stability on performance remains an open question that we investigate in this paper.

Testing the effect of team stability on firm performance is difficult as it requires very detailed micro-level data on teams and their performance and, ideally, time-series comparisons of team changes over time. In this paper we focus on the Private Equity industry which provides a near ideal setting to study this question. The PE industry is highly human capital intensive. Furthermore, it is an industry where both private equity firms and their investors put a lot of emphasis on team stability: when investors select in which fund to invest their money, stability of the team is one of their most important criteria. For example, the following quotes from private equity firm websites emphasize their views on stable teams: "We have one of the most experienced and stable teams in the private equity industry..." or "The Manager has one of the most stable private equity teams in Asia", or again "[The Manager] has been making investments together for over two decades, creating one of the most experienced and stable investment teams in the private equity business..."

The common belief in PE industry that turnover hurts performance is also reflected on contractual agreements between PE firms and investors which protect investors from key employees leaving the PE firm. According to a Bloomberg article, in April 2012, the announcement of a top executive of First Reserve Corp. – a Private Equity firm – leaving the firm was likely to trigger a "key-man" clause, a common feature in private equity investment contracts that governs what happens when a person essential to the fund leaves. In this case, according to the article, the announcement of the top executive's departure was likely to prompt an automatic suspension of investments or a decision by investors to halt future investments on a \$7.8 billion fund that completed fund raising in 2006 and a \$9 billion fund from 2009.²

²<http://www.bloomberg.com/news/articles/2012-04-02/first-reserve-s-mccomiskey-to-leave-as-co-head-of-buyouts>

To overcome the data challenge, we hand-collect data on 138 fund managers (or PE companies), 5,772 individual deals in about 500 funds, and 5,926 individuals over twenty years. This data was obtained by reading through the due diligence of a large fund-of-funds, or, in other words an investor in PE funds. Note that we have collected also the due diligence of the funds in which the fund-of-fund ultimately decided not to invest. Since this specific investor was concerned about team stability, there is ample information about the individuals in the team, with an emphasis on departures from the team as well as additions. Moreover, we can observe which individuals were in charge of a specific deal, thus allowing us to measure individual performance. We augment this dataset with biographical information of the individuals, and, thus, their characteristics. To the best of our knowledge, this is the first paper studying the PE industry, which uses such a detailed dataset on teams.

Our laboratory has some distinct advantages that allow us to do meaningful comparisons. The private equity organizations we examine are organized as partnerships, wherein a subset of the individuals are in charge of each investment the company makes. Clearly, this is a much simpler organization to study than one where individuals have multiple relationships with different hierarchical structures. Furthermore, all teams are doing a relatively similar task, which makes comparisons easier to interpret. Finally, we are able to exploit team changes over time *within* PE firms. This fund manager fixed effect estimation mitigates, to a large extent, selection concerns that threaten the validity of the reported estimates.

Contrary to the belief among private equity investors that turnover is disruptive, our results suggest that turnover has, on average, a positive effect on PE performance. Thus, this obsession with team stability may be unwarranted. All in all, our results provide a more nuanced view of turnover that will be detailed later.

We start by examining the specific deals a fund undertook and focus on the deals where some members from the team responsible for that investment left the PE firm. We find that deals with departures perform worse. Although these findings are, at first glance, consistent

with the view that turnover is disruptive, confirming to some extent investors' beliefs, the negative relationship is likely to be driven by reverse causality. Namely, it is the underperforming individuals who leave the PE firm and explain the negative correlation, instead of the turnover being disruptive for performance. To confirm this, we follow a similar approach to the one used by Bertrand and Schoar (2003) and estimate individuals' fixed effects from an OLS regression on deal level performance to capture individual performance. We find that the team members leaving the PE firm tend to be worse performing individuals.

To gauge the effect of team turnover on performance, we next look at the relation between departures at the PE team level and fund level performance. We define turnover as the average number of team members leaving the PE firm normalized by the size of the team. We find a positive and significant relation between turnover computed over a five-year period from the start of a given fund and IRR of the current fund, or average IRR of the current and subsequent one, or two funds within the same fund manager. The choice of the initial five years from the start of the fund to compute turnover is driven by the typical structure of PE funds, according to which the money is invested within this initial five-year period. By the end of the fifth year, the first signs of performance are usually apparent and it is quite plausible that the fund manager can identify underperformers. As information is revealed about individuals' quality, underperforming team members leave (Jovanovic, 1979) resulting in teams with higher average productivity.

Our intuition is that these results capture a quite immediate effect of bad performers' departures on fund performance, which thereby allows "fixing" performance of the current fund. The positive effect is halved as we extend the time horizon to include more funds in our performance calculations, indicating that most of this effect is driven by a short-term impact of departures on performance of the current fund. These results are robust to using other measures of fund performance (Multiples, DPI) and to controlling for team growth or fund and team size which may also account for differences in performance across funds. Throughout the analysis, we control for fund manager fixed effects which alleviates concerns that alternate stories specific to the managers can explain our findings.

We also follow Davis and Haltiwanger (1992) and consider an alternative definition of turnover which accounts for both team members joining and leaving the fund manager to capture the reallocation of team members associated with simultaneous job creation and destruction. Our results are robust, albeit weaker in magnitudes, again suggesting that turnover has a positive short-term effect on performance due to getting rid of underperformers. Note investments have already been made but improvements can be achieved through successful restructuring and exit of the invested deals.

We next examine a more long-term effect of turnover on performance. Our point of departure here is that turnover may allow firms to adapt their teams in a changing environment, replenish their skills and bring new ideas necessary to respond to shifting external conditions. In addition, new hires of skilled, high productivity employees can also have positive spill over effects on teams through the positive impact of the more productive employee on the productivity of peers in the same team (Kandel and Lazear 1992; Mas and Moretti, 2009). Both such effects, however, take longer to materialize and should be mostly apparent when new investment decisions are being made. To study this hypothesis, we define turnover over a five-year period before the start of a given fund. These five years correspond to the time period when the fund manager starts planning the new fund, wherein managers talk to investors about their new investment proposals and prepare their teams to reflect the changing needs and skills required to better respond to shifting external conditions.

Consistent with our prediction, we find a positive and significant effect of joiners' and leavers' turnover over five years prior to the start of the fund on subsequent performance (measured as the IRR of the subsequent fund, or the average IRR of the subsequent two funds). We are unable to replicate the same findings when we focus instead only on leavers' turnover which gives statistically insignificant results. These results support our hypothesis that turnover before the start of the fund is not about firing bad performers, but rather captures teams adapting to future conditions by bringing in different skills and fresh ideas.

To further distinguish between a short-term versus a more long-term effect of turnover

on fund performance, we follow Lazear and Spletzer (2012) and decompose turnover in three types: departures with replacement to capture team members who leave the team and get replaced, departures with no replacement to capture team members who leave and do not get replaced, and additions to teams. We find that the positive effect of turnover on performance is mainly driven by departures with replacement when we measure turnover over the first five years of the fund to capture a more immediate effect of turnover. On the contrary, the positive effect comes from additions to the team when we allow for a longer horizon and define turnover over the five years before the start of the fund. Similar to previous findings, departures with replacements proxy for replacement of bad performers with higher skill individuals and impact performance immediately. Additions to teams proxy for new hires, likely to bring in fresh ideas, and seem to matter in the long-run.

We present additional evidence in support of both channels. Consistent with the view that the positive effect of turnover is due to bad performers leaving, we show that better performing PE firms, as proxied by their past funds' performance, fire a higher fraction of their underperforming employees. Moreover, we exploit deal-level data and show that deals attributed to individuals who subsequently leave the PE firm are associated with lower performance as compared to other deals within the same manager, invested in the same region and year, or exited in the same year.

To test whether turnover allows teams to adapt and be better able to respond to changes in investment opportunities, we examine whether there is a change in skill composition of better performing PE firms following recessions. Here, we implicitly assume that PE firms need to successfully restructure their invested firms during recessions and therefore their demand for operational skills increases. We find that, one year following recessions, better performing PE firms, as proxied by their past funds' performance, have a higher share of individuals with operational skills in their teams and experience higher turnover of team members with operational skills. Our hypothesis that replenishing of skills and new ideas benefit performance is also confirmed in deal-level analysis. We show that deals attributed to individuals new to the PE firm over-perform other deals within the same manager, invested in the same region and year, or exited in the same year.

The main message of the paper is that turnover, contrary to investors' beliefs, seems to have, on average, a positive effect on performance in the PE industry. No matter what definition or timing of turnover, measure or horizon of performance we look at, we never find a negative relationship between turnover and performance. Moreover, we exploit the richness of our data and uncover two separate mechanisms that can explain this positive relationship. Why is it though the case that investors believe that turnover hurts performance? As argued earlier, one possibility may be that investors are confused by the reverse causality of the relationship, as we depict it using deal level data. Another explanation may be that indeed, there are cases where departures can generate negative outcomes to the firm, especially when high skill employees, valuable to the firm, leave. To see this, we parse the performance results into subgroups where we expect to find differential effects. We show a negative differential effect of turnover on performance when high-skill employees, or employees with firm-specific human capital leave the firm. These findings are consistent with the idea that accumulation of firm-specific human capital improves productivity (Huckman and Pisano, 2006) and departure of experienced, skilled workers disrupts teams and decreases productivity (Bartel et al., 2014).

An additional implication of our results is that there may be frictions that result in lower team turnover than optimal. As argued earlier, one reason might be that departures may convey bad news about management skills in choosing the right team and therefore generating returns. This problem will be more severe when there are large information asymmetries between investors and PE firms, leading to sub-optimally stable teams. On the contrary, established PE firms with better reputation among investors will be less worried about this signal extraction problem, being thus more willing to change their teams in response to changing external conditions. Using fund size as a proxy for reputation, we find results in line with this argument. The effect of departures on performance is larger for smaller, and thus less reputable managers, as those are the managers who are, on average, less reluctant to change their teams.

Our paper contributes to an important literature that studies PE performance and its determinants. Private Equity has developed into a dominant asset class with \$3.8 trillion

assets under management in 2014, and \$495 billion in capital raised by investors globally in 2014 alone.³ Several papers study private equity returns and the determinants of PE performance (Kaplan and Schoar, 2005; Phalippou, and Gottschalg, 2009; Higon and Stucke, 2012; Sensoy and Robinson, 2013; Harris, Jenkinson, and Kaplan, 2014). Other studies have documented the fact that private equity can increase the value of the firm through operational improvements (Agrawal and Tambe, 2016; Bernstein and Sheen, 2016). Our study adds to this literature highlighting an important driver of PE performance, understudied in the literature, that of team stability. In our study particular attention is paid to the fundraising stage: Chung, Sensoy, Stern, and Weisbach (2012) show the importance of fundraising for the incentives to managers.

There is also a number of studies examining the role of human capital mainly in VC firms. Agrawal and Ljungqvist (2015) show that VC firms' ability to assess human capital of their partners impacts their investment decisions. Bottazzi, Rin, and Hellmann (2016), who study the effect of trust in VC investment decisions, show that partner characteristics in VC teams, such as their nationality, education and experience matter for this effect of trust and affect the choice of projects invested. Ewens and Rhodes-Kropf (2015) study the contribution of VC partners to the performance of the VC firm and find that the partners' human capital is more important than the firms' organization capital in determining performance. Gompers, Mukharlyamov, and Xuan (2014) show that partners who share similar backgrounds are more likely to collaborate in VC syndications and this "homophily" lowers the probability of investment success. Ivashina and Lerner (2016) use a sample of Private Equity partnerships and show that inequality in fund economics leads to departures of senior partners with negative effects on firms' ability to raise additional capital. Our paper instead exploits information on PE teams with a focus on team turnover and provides rich evidence that team turnover has beneficial effects on fund performance both in the long and the short-run.

³See 2015 Preqin Global Private Equity & Venture Capital Report.

II Data

We build a novel dataset of Private Equity teams and their performance covering 1986 through 2011 from Capital Dynamics due diligence archives. Capital Dynamics is a Limited Partner investing in Private Equity funds. According to Preqin, Capital Dynamics is among the 10 biggest private equity fund of funds investment managers and has global operations with 13 offices in the United States, Europe, Asia, and Australia. Capital Dynamics analyses all Private Equity funds which seek funding and keeps a detailed archive of their due diligence which is standardized across funds. The due diligence takes place before Capital Dynamics makes the final decision to invest in a Private Equity fund or not, and therefore sample selection issues (e.g. coverage only of the better performing funds) are not a concern.

Our sample covers information on 138 fund managers or PE teams, 5,772 individual deals in about 500 funds, and 5,926 individuals covering two decades of private equity team development. At the deal level, we collect information of performance of all individual deal-companies a fund has invested in, as well as information on deal attribution, or in other words, information on which PE team members are responsible for a given investment. The performance measures available are multiple and gross IRR – the standard measures used in the industry. These deals can be realized, unrealized, or written-off investments for which we also observe the holding period of the investment, and in some cases the ownership of the PE firm, and the deals’ geographies.

We also collect all individuals’ characteristics, including their name, their position, a short bio that typically includes information on previous work experience and their education, date of birth, nationality, dates of joining and leaving the PE firm. When available, we also collect data on carry entitlement, namely the share of the profits of the investment fund paid to the team, and inclusion in the key man clause, a clause that protects investors of a given fund from key executives leaving the fund manager and transferring a significant amount of control over to a colleague without their consent. Key men are typically founding partners or key executives who are believed (by investors) to be essential to the

organization. These individuals are high skill individuals and are typically those who bring valuable relationships to the PE firm.

We code the short bios and are able to create two measures of skill. The first is based on education and uses the possession of an MBA degree. The second is based on previous work experience and allows us to classify individuals according to their specialization into individuals with operational skills, financial skills, and other. We classify individuals as operational types if they have been working in operational roles (e.g. engineers) outside the finance sector before joining the PE firm. Typically, these individuals hold also degrees in science. The financial types are those who worked in Finance before, which mainly covers investment banking jobs. Other include all remaining categories such as law or accounting background.

We also create a measure of hierarchy within PE firms based on the job titles of the individuals. We attach a numerical value which is decreasing in seniority within firms and ensures meaningful comparisons across firms. This variable takes values between 1 and 6. For example, a value of 1 corresponds to positions at the top of the hierarchy like those of a Managing Partner or a Senior Partner, a value of 2 includes positions like those of a Partner, while a value of 6 includes positions like those of an Analyst.

To validate our data and cross-check their accuracy, we hand-collect information on the PE teams from “*Who is Who in Private Equity*”, a series of books published every two years between 2002 and 2008 covering PE teams of European PE firms. The information available in these books are individual characteristics and information on deal attribution. Most importantly, given the books allow us to observe the evolution of the teams, we are able to double check whether the PE firms truthfully report to their LPs when an individual leaves the PE firm. A potential concern would be that due to the importance of team stability for the LPs, PE firms misreport such information during the due diligence process – the process which determines whether they receive funding for subsequent funds. Although it does not seem plausible that it is easy to manipulate such information, we validate that this is indeed not the case. We find no discrepancy between the two data sources for the

overlapping fund managers. Moreover, in the very few cases where biographical information is missing in our main dataset, we use the books to supplement the missing values.

We also merge our data with fund level information from Preqin. Preqin gives us the most up-to-date information on fund performance. We have information on 513 funds since 1996, although not all performance measures are available for all funds. We observe three measures of performance: multiple, irr, and dpi (distribution to paid in ratio), defined as the proportion of the called up capital that has been distributed or returned back to LPs.

II.1 The profile of the PE team

Panel A, in Table 1, presents summary statistics on individuals' characteristics in our sample. These characteristics are computed based on individuals included in our deal attribution sample, namely exclude individuals for which we do not have information on deal making involvement. 29% of the individuals hold an MBA degree, the majority of which (81%) is granted from a top 10 MBA program (according to the 2013 FT MBA rankings). The majority of the individuals working in the PE industry have financial skills (48% in our sample), and 20% have operational skills. 8% of the individuals have been part of a key man clause, while 32% are entitled to carry. Figure 1 shows how individual profiles and expertise change over time by plotting the number of private equity professionals hired and departed as well as those with operational and financial skills. The plot shows that over the last two cycles more professionals with a finance background have been hired.

The deal attribution data, which provide information on which individuals work on what deals, allow us to observe the creation of “smaller” teams formed within the private equity firm. These teams work on a deal from its origination through its exit – an average duration of 6 years in our sample. Panel B presents the profile of the teams formed using the deal attribution data. On average, there are 3 individuals working at a given deal. 33% of the deal team members have operation skills, 44% have financial skills and 31% hold an MBA degree. The team members at the time of the investment are 37 years old on average, and they are pretty senior: 23% are key men, 44% are entitled to carry, and

they have been working for the PE firm for 6 years, on average. We create a measure of how busy individuals are, by looking at the number of deals they start working on at a given year – on average, the deal team members start working on two new deals at a given investment year. A limitation of our data is that we do not observe whether an individual leaves a deal team to work on another deal within the PE firm. However, we know that individuals exit deals upon leaving the PE firm. In our sample, we observe individuals leaving the PE firm during the life of a deal in 21% of the deals.

Panel C, Table 1, presents summary statistics for the private equity teams. The average team in our sample has 49 individuals. On average, 7 individuals have operational skills, and 16 have financial skills. 11 team members hold an MBA degree, 11 are entitled to carry and 3 are key men. Turnover is quite high with 13 individuals leaving the team on average during our sample period.

II.2 Deal level and fund level characteristics

Table 2 presents summary statistics of the invested deals by PE firms collected from Capital Dynamics due diligence archives (Panel A) and of the PE funds collected from Preqin (Panel B).

Overall, we have data on 4,055 deals, 86% of which are realized, and 14% are written-off investments. Throughout our analysis we exclude unrealized deals (1,659 in total), although our results are robust to including those deals. Figure 2 presents the number of deals invested during our sample period. The lower numbers in the latter part of the sample are due to the fact that there is an increasing number of unrealized deals in that latter period. Figure 2 also reflects the booming period of early 2000s and the subsequent more moderate level of deals. The deals initiated during our sample period that are subsequently written-off are fairly equally distributed, and peaked in 2000 (29% of the investments in 2000 were subsequently written-off). The investment-deals also span a wide range of geographies. 61% of the deals are European companies, 30% are US companies, 5% are Asian companies,

2% are Latin American companies and the rest are based in Oceania.⁴ For about 2,900 deals, we can also observe the country of the deal. Figure 3 presents the distribution of deals across countries in our sample: 27% of the deals are US companies, followed by UK companies (26%), French (9%), and German companies (7%). The majority of the deals are manufacturing firms (40%), followed by Retail and Wholesale Trade (23%), Services (20%), while the remaining firms are evenly populated across the remaining industries. As shown in Panel A, Table 2, the average (median) deal in our sample has an IRR of 36% (25%), and a multiple of 2.81 (2.08), while the average (median) ownership of the investment by the PE firm is 48% (49%).

We also collect information on 500 PE funds from Preqin. The median number of funds per fund manager in our sample is 5 funds. Panel B, Table 2, shows that the average (median) fund in our sample has an IRR of 14.4% (20.7%), a multiple of 1.61 (1.48), and a DPI of 104 (94.3). Funds in our sample are quite large, with an average (median) fund size of \$1,625 mil (\$715 mil). The average fund is experiencing overall turnover of 13% (19%) measured over the first 5 years for each fund (5 years prior to each fund).

II.3 Turnover and the temporal structure of PE funds

To better understand the effect of turnover on PE fund performance, it is important to discuss the temporal structure of PE funds. On average, funds close after 10 years. The typical life cycle of a fund includes sourcing/investing in deals, restructuring and exit. The first 5 years of the fund is when the money raised is invested. Although most investment-deals have not exited yet, by the end of year 5 it is typically apparent to the PE team and investors how the funds' investments are performing. As such, PE firms can take actions to improve performance during the restructuring/exit phase, by changing their teams and replacing their underperforming individuals. Such team changes cannot impact the focus or investment profile of the fund, as investments have already been made and there is only 5 years till exit, but can potentially fix performance and help exit successfully.

⁴These statistics are based on 82% of the deals for which this information is available.

To capture this idea of a more immediate effect of turnover on performance, we define turnover over a five-year period at the start of each fund. Specifically, $Turnover (leavers)_{jk,(t,t+5)}$ is the average number of team members who leave the PE team normalized by the size of the team, computed over a five-year period (between t and $t + 5$) at the start of fund k with vintage year t . $Turnover (leavers+joiners)_{jk,(t,t+5)}$ is the average number of team members who leave and join the PE team normalized by the size of the team, computed over a five-year period (between t and $t + 5$) at the start of fund k with vintage year t .

Moreover, funds tend typically to be overlapping with each other with subsequent funds raised, on average, with a 5 year lag. The fundraising period for each fund usually takes place a couple of years prior to the start of the fund but funds are planned for quite a long period even before fundraising. This period is characterized by PE firms proposing their investment thesis to potential investors, including a unique comparative advantage of the next fund and a team with the right skills to fit that proposition. Changes in teams during this period, thus, tend to have a more long-term focus, with PE firms adding members to rebalance their teams and acquire new skills that will help them adapt to changing business conditions. Note that, unlike the short-term effect of turnover on performance discussed above, the effect here is more long-term as it capitalizes on new ideas and skills of team members joining rather than on underperforming individuals leaving the PE firm.

To test the notion of a more long-term effect of turnover on performance through team adaptability, we define turnover over a five-year period prior to the start of each fund. In particular, $Turnover (leavers+joiners)_{jk,(t-5,t-1)}$ is the average number of team members who join and leave the PE team normalized by the size of the team, computed over a five-year period (between $t - 5$ and $t - 1$) prior to the start of fund k with vintage year t . $Turnover (leavers)_{jk,(t-5,t-1)}$ is the average number of team members who leave the PE team normalized by the size of the team, computed over a five-year period (between $t - 5$ and $t - 1$) prior to the start of fund k with vintage year t .

III Deal level evidence

III.1 Turnover and deal performance: A naive approach

We start by looking at the relationship between a team member leaving the PE firm during the life of a given investment deal and deal performance. Thus, we compare the performance of investment-deals with turnover relative to investment-deals with no turnover. We estimate regressions of the following form:

$$Performance_{it} = \alpha_t + \lambda_j + \delta \cdot Turnover_{it} + \beta \cdot X_{it} + \epsilon_{it} \quad (1)$$

where i and t index investment-deals and investment years; α_t and λ_j are investment-year and fund manager fixed effects respectively; $Turnover_{it}$ takes a value of 1 for investment-deals where a team member working on that deal left the PE firm during the life of the deal, and 0 otherwise; X_{it} are team-level control variables; and ϵ_{it} is the error term. The coefficient δ captures the effect of turnover on deal level performance. Our sample includes all realized and written-off deals invested between 1986 and 2011, and excludes any unrealized investments in our data.⁵ Standard errors are clustered at the fund manager level.

Table 3 presents the estimates of regression (1). We use gross IRR (winsorized at 1%) as our measure of performance. IRR is the rate of return of an investor who re-invests all dividends at that rate of return, and is the most common measure used by PE firms in practice. Column 1 includes fund manager fixed effects to ensure that comparisons are made within the same fund manager and investment year fixed effects to control for macroeconomic shocks at the time of investment. We report a negative correlation for deals with turnover within the same fund manager initiated at the same year, which is statistically significant at the 1% level and also economically significant. A deal with turnover has 23% lower IRR compared to a deal of the same fund manager, invested at the same year, without

⁵Note that including the unrealized deals does not change the results.

turnover.⁶

In Column 2, we control for local shocks at the region, at the time of the deal origination, by interacting investment year and region fixed effects. In Column 3, we add interacted region and exit-year fixed effects to the previous specification to control for the effect of local shocks at the time of the deal exit. The coefficient is still statistically significant but the magnitude is halved. In Column 4, we repeat the specification in Column 3 including team-level controls. After better controlling for deal-team characteristics, the coefficient on the turnover variable gets just out of significance, although it is still quite large in magnitude.

This “in-sample” analysis reflects the common belief among PE investors, embedded in most due diligence processes, that team stability is key to continued performance. Investors possibly observe a departure of a team member half way through an investment, but only later find out that those deals are underperforming. Thus, they may associate turnover to worse performance of the deal, without realizing that this may be due to reverse causality. Indeed, we show, in the next section, that this negative relationship is capturing the fact that leavers are, on average, underperforming individuals (and thus in charge of deals that are underperforming) and they are getting “kicked out” from the PE firm.

III.2 Who is more likely to leave?

In this section, we examine the individual characteristics related to individuals leaving the PE firms. To conduct this analysis, we first create a proxy for individual performance, estimating individuals’ fixed effects from an OLS regression on deal level performance.⁷ We separate the individuals’ effect from the fund manager they work for by including fixed effects for fund managers. We also compare individual performance only between peers who monitor companies invested at the same region and year, or exited at the same region

⁶Table A1 repeat specifications in Columns 2-4, Table 3, using multiples and the probability of a written-off deal to measure deal performance.

⁷We follow a similar approach to the one used by Bertrand and Schoar (2003) who identify the effect of corporate managers on firm policies separately from firm effects.

and year. We estimate regressions of the following form:

$$Performance_{it} = \alpha_{t1} \cdot \alpha_k + \alpha_{t2} \cdot \alpha_k + \lambda_j + \lambda_{\mathbf{Individual}} + \epsilon_{it} \quad (2)$$

where i , t , and k index investment-deals, years, and regions; α_{t1} , α_{t2} , α_k and λ_j are investment-year, exit-year, region, and fund manager fixed effects respectively; $\lambda_{\mathbf{Individual}}$ are team members fixed effects; and ϵ_{it} is the error term. Our sample includes all realized and written-off deals invested between 1986 and 2011, and excludes any unrealized investments in our data. Standard errors are clustered at the fund manager level. Figure A1 in the appendix plots the histogram of the estimated coefficients of the individual effects to be used in the analysis that follows.

In Table 4, we estimate a probit regression to examine the individual characteristics which predict departures. The dependent variable is a dummy variable which takes a value of 1 if an individual left the PE firm during our sample period, and 0 otherwise. The independent variables are individual characteristics that may be potentially correlated with leaving the PE firm. Our measure of individual performance (*Indiv. Performance*) is the estimated coefficients from the individual effects from regression (2), and is increasing with better performance. All other individual controls are defined in Section II. We include fund manager fixed effects across specifications and cluster standard errors at the fund manager level.

Our measure of individual performance is estimated from regression (2) based on all realized deals in Columns 1-2, and on all realized deals except those with turnover in Columns 3-4. Excluding deals with turnover in Columns 3-4 ensures that our measure of high performing individuals is based on performance prior to leaving and does not capture a potentially disruptive effect of turnover on performance. In Columns 1 and 3, we include *Indiv.Performance* as the only independent variable. The coefficient is negative and statistically significant at 1% and 5% level respectively, indicating that the individuals who leave the PE firm are those who perform badly.

In Columns 2 and 4, we include further individual level controls that are potentially

correlated with departures. As we would expect, individuals entitled to carry and those included in the key man clause – the most skilled individuals – are less likely to leave. Moreover, individuals with operational skills are more likely to leave, which may be suggestive of the fact that PE firms need to replenish operational expertise more often depending on the needs of the organization. Finally, we find a weak and negative relationship between departures and our *Rank* variable, namely more senior employees in the organization are more likely to leave. This may be consistent with more senior employees retiring and leaving the PE firm, although this result is quite weak. Overall, these findings suggest that PE team departures are related to, on average, worse performing individuals leaving the firm.

III.3 Deal performance of leavers and joiners

We further exploit deal level data to examine the performance of deals attributed to individuals: i) who have joined the PE team up until three years prior to the investment of the deal, ii) who leave the PE firm during or after the life of an investment. We predict that joiners bring to the firm new skills and ideas which increase teams' productivity. The positive effect of hiring a high productivity employee may have a multiplicative effect when work is organized in teams as there are positive productivity spillovers from the introduction of high productivity employees on their co-workers (Mas and Moretti, 2009). On the other hand, we confirm again that departures are related to underperforming individuals leaving once information about their quality is revealed (Jovanovic, 1979), which implies an increase in average team productivity.

Table 5 presents the results. In Column 1, we compare the performance of deals attributed to individuals new to PE firms to other deals within the same manager. We use gross IRR as our measure of performance and require that individuals have joined the firm at most three years prior to the deal investment. The coefficient of variable *Deals of joiners* is positive and statistically significant, indicating that new additions to the team bring new ideas and skills which benefit performance. The effect is also economically significant: deals attributed to new team members outperform other deals within the manager by 9%. We

control for fund manager fixed effects to ensure that comparisons are made within the same fund manager, investment-year times region fixed effects to control for local shocks at the region at the time of the deal origination, interacted region and exit-year fixed effects to control for the effect of local shocks at the time of the deal exit, and several team characteristics that may affect deal performance. The variety of controls alleviates concerns that macroeconomic, local economic shocks, or other team or deal level characteristics are driving the results.

In Column 2, we repeat the specification in Column 1 but instead compare the performance of deals attributed to individuals who leave the PE firm during or after the life of the deal to other deals within the same manager. The coefficient of variable *Deals of leavers* is negative and statistically significant, indicating that team members tend to leave the manager when they underperform. The effect is also economically significant: deals attributed to team members who subsequently leave the manager underperform other deals within the manager by 12%.

In Column 3, we estimate both coefficients of *Deals of joiners* and *Deals of leavers* in the same specification. Results are very similar both in terms of significance and in terms of economic magnitudes. In Columns 4-6, we repeat the same specifications as in Columns 1-3, except we exclude from the sample any deals which experienced turnover due to a team member leaving. Excluding the deals with turnover ensures that our results are not driven by a potentially disruptive effect of turnover on performance.

Although we cannot directly attribute one joiner to a replacement of a specific leaver, these results suggest that PE managers not only manage to get rid of underperforming individuals, but also replace them with better performers on average.

IV Team turnover and fund performance

To gauge the effect of team turnover on performance, we examine fund performance. Using fund performance allows us to look at the relation between turnover and future performance,

to eliminate the obvious reverse causality that we found at the deal level. As we want to explore two different channels by which turnover could affect performance, we distinguish between leavers and joiners in our estimations and we exploit different temporal horizons. Our hypothesis is that replacing an underperforming team member should have a more immediate effect on fund performance as compared to changing the team to rebalance its skills and bring fresh ideas.

IV.1 Turnover and short-term fund performance

Our point of departure is that leavers are, on average, underperforming individuals leaving the PE firm, as shown above. We predict that leavers' turnover should have an almost immediate effect on fund performance as it should affect how efficiently deals are restructured and exited at the current fund. We estimate regressions of the following form:

$$Performance_{j,k} = \lambda_j + \delta \cdot Turnover (leavers)_{jk,(t,t+5)} + \beta \cdot X_{j,k} + \epsilon_{j,(k)} \quad (3)$$

where j , k , and t index PE firms, funds, and fund vintage years; λ_j are fund manager fixed effects; $Performance_{j,k}$ is performance, measured as the logarithm of net IRR and winsorized at 1% level, of the current fund k of manager j . $Turnover (leavers)_{jk,(t,t+5)}$ is defined in section II.3; $X_{j,k}$ are fund-level control variables; and ϵ is the error term. The coefficient δ captures the effect of turnover on fund-level performance. Our sample includes all funds with vintage years after 1995 as the Preqin coverage of our sample is very sparse prior to 1995. Standard errors are clustered at the fund manager level.

Table 6 presents the estimates of regression (3). In Column 1, the coefficient δ is positive and significant at the 5% level. It is also economically significant: An increase of turnover due to departures by 1 percentage point, is related to 4.4% higher IRR. We focus on within fund manager variation by controlling for fund manager fixed effects. Controlling for fund manager time invariant characteristics alleviates concerns that the results may be explained by alternate stories specific to the managers.

In Columns 2-3, we use instead two variations to define fund performance. In Column

2, we look at the average performance of the current fund k , and the subsequent fund $k + 1$. In Column 3, we look at the average performance of the current fund k , and the subsequent two funds $k + 1$ and $k + 2$. The coefficients on turnover remain statistically significant but weaken largely as we extend the horizon.

Although there is no obvious reason why team or fund size would predict higher returns, we do include measures of team growth or size in all our specifications: *Team Growth* is defined as the growth rate in the size of the team over the period t and $t + 5$ at a given fund; *Team Size* is the number of team members (log-transformed) measured at t , the start of fund k ; and *Team Size Squared* is its squared term to analyze the functional form of this relation. We additionally control for fund size (*Size*) measured as the dollar amount of capital a fund has under management (log transformed). Controls are mostly negative and not significant with the exception of fund size which is negative and mostly statistically significant. This result is consistent with the intuition that PE firms may try to increase their compensation by growing fund size, hurting performance (Lopez-de-Silanes, Phalippou, and Gottschalg, 2013).

We measure turnover over the five-year period starting at fund vintage year t as this is the period when the money raised is invested for fund k . At the end of the fifth year, PE firms and investors are typically able to make some meaningful predictions on fund's performance and plausibly identify underperforming individuals. As information is revealed about individuals' quality, underperforming team members leave (Jovanovic, 1979). Thus, what we are capturing is the positive effect of replacing bad performing individuals in order to fix fund performance. This effect is almost immediate as shown by the larger magnitude on the performance of current fund k . Moreover, "kicking out" bad performers results, on average, in better performing teams who will be responsible for sourcing deals in subsequent funds. Thus, we also observe a positive and significant effect in Columns 2 and 3, albeit weaker in magnitude.

In Columns 4-6, we repeat the specifications in Columns 1-3, Table 6, using an alternative definition of turnover (*Turnover (leavers+joiners)_{jk,(t,t+5)}*) based on both individuals

who leave and join the team, as defined in section II.3. Following Davis and Haltiwanger (1992), we add turnover due to team members joining the fund manager to capture the reallocation of team members associated with simultaneous job creation and destruction and the replacement of bad performing individuals with better ones. The coefficient is positive and statistically significant for this alternative definition of turnover but weaker in magnitude: an increase of joiners' and leavers' turnover by 1 percentage point is related to 2.6% higher IRR. These findings are consistent with the fact that, in the short run, what matters most for performance is replacing bad performers. Similarly to previous results, the magnitudes weaken further as we extend the horizon.⁸

IV.2 Turnover and long-term fund performance

We next modify our analysis to examine a more long-term effect of turnover on performance. Thus, we define turnover over a five-year period prior to the start of fund k , as detailed in section II.3. This period coincides with the fundraising period of the next fund over which PE firms try to reposition themselves in the changing business conditions by adapting and rebalancing their teams, and present a convincing investment proposal to potential investors. We predict that such replenishing of the team's skills should have a positive long-term effect on fund performance. On the contrary, the short-lived effect of firing bad performers discussed above should fade away in the long-run.

We present results in Table 7. In Columns 1-2, we examine turnover based on leavers, and in Columns 3-4 we examine turnover based on leavers and joiners. In Columns 1 and 3, performance is defined as the logarithm of net IRR of fund k and in Columns 2 and 4, performance is the average IRR of the current fund k and the subsequent fund $k + 1$. In these regressions, we include the same controls as in Table 6 (team growth, team size, team size squared, and fund size) to capture differences in growth and size across funds as well as fund manager fixed effects to control for manager specific characteristics.⁹

⁸In Table A2, we repeat the specifications in Table 6 using multiples (Panel A) and DPI (Panel B) to measure fund performance.

⁹We also estimate these results defining team growth between $t - 5$ and $t - 1$ to parallel the

As predicted, we find no significant effect of leavers' turnover on subsequent long-term performance. On the contrary, we find a positive and statistically significant effect of leavers' and joiners' turnover on fund performance in the long-term. These results suggest that what matters in the long-run is not hiring individuals who can better restructure existing investments (as shown in Table 6), but rather hiring individuals who bring in fresh ideas and skills to the team, or who are better suited to source and run new investments.

One concern with our findings might be that fund managers with high team turnover are those who cannot raise subsequent funds and, thus, go out of business. Our results would then suffer from a survivorship bias as the funds with high turnover and subsequent bad performance would exit the sample. We do not observe information on subsequent funds in 6% of cases, in which case we assume these managers go out of business. Leavers' turnover of these managers is not higher than the rest of the sample, and is, in fact, about 20% lower than the median leavers' turnover in our sample. In unreported regressions, we impute performance values for these managers, assuming they have an IRR of 0 the year for which we observe the latest turnover information, and repeat our baseline specifications for short-run and long-run performance. Our results are robust.

IV.3 Decomposing turnover

To alternatively document a short-term versus a more long-term effect of turnover on fund performance, we follow Lazear and Spletzer (2012) and decompose turnover in three components: departures with replacement, departures with no replacement, and addition to teams. Departures with replacement capture team members who leave the team and get replaced; departures with no replacement capture team members who leave and do not get replaced; additions to teams capture new hires.

To examine immediate effects of turnover, we define the three components over a five-year period following the start of a given fund. Specifically, we define *Departures with replacement* as a dummy which takes a value of 1 if the sum of individuals replaced over a

turnover calculations. Results are robust.

five-year period (between t and $t + 5$) at the start of fund k with vintage year t , normalized by the size of the team, exceeds the median value, and is 0 otherwise. We define *Departures with no replacement* as a dummy which takes the value of 1 if the sum of individuals who left without being replaced over a five-year period (between t and $t + 5$) at the start of fund k with vintage year t , normalized by the size of the team, exceeds the median value, and is 0 otherwise. We define *Addition to teams* as a dummy which takes the value of 1 if the sum of pure additions to teams over a five-year period (between t and $t + 5$) at the start of fund k with vintage year t , normalized by the size of the team, exceeds the median value, and is 0 otherwise.

We next repeat specifications in Columns 1-3, Table 6, using the decomposition of turnover outlined above. We present the results in Columns 1-3, Table 8. Across specifications, the coefficient of *Departures with replacement* is positive and statistically significant. Moreover, the magnitudes of the coefficients weaken as we increase the number of funds we include in our calculations. The coefficient on *Departures with no replacement* is positive and weakly statistically significant (only in the first column), while the coefficient on *Additions to teams* is not statistically significant. Note these regressions control for fund manager fixed effects and fund level controls (fund and team size) which account for changes in fund and team growth over time. These results confirm earlier findings, presented in Table 6, and suggest that replacements of bad performers, likely captured by *Departures with replacement*, impact fund performance immediately.

To parallel our analysis on the more long-term effects of turnover, we define the three components as before, except over a five-year period (between $t - 5$ and $t - 1$) prior to the start of fund k . We next repeat specifications in Columns 1-2, Table 7, using instead the three components to characterize turnover. We report results in Columns 4-5, Table 8. Across specifications, we find a positive and significant effect on *Additions to teams*, while the coefficients of the other two components are not statistically significant. Consistent with previous findings, *Additions to teams*, our proxy for new hires, suggests that team updating seems to matter in the long-run as fresh ideas help firms respond to shifting external conditions.

V Further evidence concerning mechanisms

So far, the results seem to suggest two channels that may explain the positive relation between turnover and performance. Departures may be positive if individuals leaving the PE team are those individuals who underperform. Alternatively, departures may be positive when new hires bring new ideas and skills to the team, necessary for teams to be able to respond to changing business conditions. Next, we present further evidence in support of both mechanisms.

V.1 Departures of bad performers

First, we present further evidence of the hypothesis that the effect of turnover will be positive when bad performers are leaving the PE firm. We sort PE firms in good and bad performers based on their past funds' performance and test whether good performers are better able to fire individuals who underperform. We create a time-varying variable for each manager which takes a value of 1 if PE firms' funds prior performance is above the sample median, and 0 otherwise. Then, we characterize individuals as bad performers using deal attribution performance data and count for each year the number of bad performers in the team and the number of bad performers leaving.¹⁰

In Table 9, Column 1, we examine whether better performing managers are firing a higher fraction of bad performers. We include manager fixed effects to control for characteristics specific to the manager that may affect firing decisions and year fixed effects to control for macro-level trends in firms' firing policies. Indeed, the estimated coefficient is positive and statistically significant at 5% level. In Column 2, we further control for

¹⁰We start by characterizing a given deal as underperforming if both the deal multiple and IRR are lower than the median multiple and IRR of all deals within a manager. Using the deal attribution data, we count the number of deals each individual is responsible for as well as the number of these deals that underperform as compared to other deals within the manager. At a given year, we thus observe the ratio of underperforming deals a given individual is responsible for and characterize individuals as underperforming if the median of this ratio is worse than the team's median ratio. This way we make sure our results are not driven by extreme outliers or bad luck, such as extreme negative performance of a single deal at a given year. We then compute for each year, the count of underperforming individuals, as defined above, and the number of bad performers leaving.

size (calculated based on past funds' size) to control for the fact that larger managers may be able to replace bad performers more easily and results are robust. Although unlikely, Columns 3-4 look at the possibility that better managers may employ more bad performers in their teams which may be then driving the previous result. Thus, we repeat specifications in Columns 1-2 but use instead the logarithm of one plus the number of bad performers as our dependent variable. As expected, results are not significant. On the contrary, we find a positive and statistically significant coefficient in Columns 5-6, where we examine the relation between managers' prior performance and the logarithm of one plus the number of bad performers leaving the team.

V.2 Team adaptability

Second, we present evidence in support of our prediction that turnover helps teams to adapt and replenish their skills in response to shifting demand. To test this, we hypothesize that operational skills are more valuable in recessions due to the increasing need for PE teams to restructure companies they are invested in. We, thus, examine whether there is a change in team composition for better performing managers following recessions.

We define team composition as the share of individuals with operational skills in a given year. Column 1, Table 10, shows that, on average, better performing managers (calculated based on PE firms' funds prior performance as in Table 9) have lower share of individuals with operational skills in their teams. However, one year following recessions, we observe a shift in team composition of better performing managers towards more operational skills: the interaction coefficient is positive and statistically significant at 5% level. Column 1 controls for managers and year fixed effects but includes no other controls, while Column 2 additionally controls for size. Results remain unchanged.¹¹

We supplement these findings, in Columns 3-4, Table 10, where we consider operational turnover, defined as the number of individuals with operational skills joining and leaving

¹¹We define recessions at the region-year level as a dummy which takes a value of 1 if GDP growth rate is negative for three consecutive quarters in the region.

the PE team at a given year normalized by the size of the team, as our dependent variable. Consistent with our previous findings, we observe a positive and significant interaction coefficient, indicating that better performing managers change their teams following recessions in order to bring in new skills and ideas and adapt to the changing investment opportunities.

V.3 Investors and team stability

Team stability has been considered key to continued performance by PE investors and is embedded in most due diligence processes. This is surprising given our results of a positive relationship between turnover and subsequent performance. Why is it the case that investors believe turnover hurts performance? We offer two explanations to explain this inconsistency.

First, it is possible that the endogeneity of the relationship between turnover and performance creates confusion. As shown in Table 3, turnover may seem negatively related with performance. However, this relationship is explained by bad performers leaving, as shown in Tables 4 and 5, rather than by departures hurting performance.

Second, our results show that the relationship between turnover and performance is positive, on average. However, there may be indeed cases where departures are not optimal, such as departures of high skill employees, or experienced employees with firm-specific human capital. To see this, we parse the performance results into subgroups where we expect to find differential effects.

We first exploit information on individuals included in the key man clause. These individuals are talented, high skill employees who are believed by investors to be key to performance. To parallel our baseline analysis, we define a variable *Turnover (leavers)* $Skilled_{jk,(t, t+5)}$ as the average number of keymen who leave the PE firm normalized by the size of the team, computed over a five-year period (between t and $t + 5$) at the start of fund k with vintage year t . We add the interaction between turnover (based on individuals leaving) and this new variable in our baseline specifications. We report the results in

Columns 1-3, Table 11. Consistent with our intuition, the interaction coefficient is negative and statistically significant across specifications, while the baseline effect of departures remains positive and statistically significant.

Moreover, we use information about the job tenure of individuals at the time of leaving to proxy for senior employees with a lot of experience and firm-specific knowledge. We consider that individuals have high job tenure if they have been with the PE firm for more than 6 years (the average tenure in our sample). Thus, *Turnover (leavers) Senior* $_{jk,(t, t+5)}$ is defined as the average number of individuals with high job tenure who leave the PE firm normalized by the size of the team, computed over a five-year period (between t and $t + 5$) at the start of fund k with vintage year t . In Columns 4-6, Table 11, we show a negative differential effect of turnover on performance when employees with firm-specific human capital leave the firm. These findings are consistent with the idea that accumulation of firm-specific human capital improves productivity (Huckman and Pisano, 2006) and departure of experienced, skilled workers disrupts teams and decreases productivity (Bartel et al., 2014).

VI Turnover and asymmetric information

Our results suggest that team updating can enhance subsequent fund performance. These positive and significant effects imply, however, that frictions may lead to stable teams even though a change in team composition might be optimal. One such friction is information asymmetries between managers and investors. Consider, for example, a scenario in which a cash constrained entrepreneur has to access finance from an external investor. Presence of asymmetric information between the two parties may make the entrepreneur less willing to change her team because of a signal extraction problem. Faced with an information problem if the external investors cannot decipher whether the change in team composition reflects on the entrepreneur's ability or the changing external conditions, this would make the entrepreneur more reluctant to alter her team.

These informational asymmetries should be more severe in cases where managers do not

have an established reputation among investors. If a firm is not good at choosing the right team, investors may doubt the overall credibility of the manager to generate returns. These managers will, thereby, be more reluctant to adapt their teams to changing conditions, as compared to more reputable firms. To proxy for manager reputation in our data, we use fund size (*Size*) measured as the dollar amount of capital a fund has under management (log transformed).

In unreported regressions, we add an interaction term between leavers' turnover (defined as in Table 6) and fund size – our proxy for more reputable managers. The interaction coefficient is negative and mostly significant. These results suggest that the marginal effect of turnover is higher for the less reputable managers, as those are the managers that are more reluctant, on average, to change their teams optimally due to the signal extraction problem.

VII Conclusion

We study how team turnover may affect performance in an organization. Although turnover may have some negative effects – a view often shared by practitioners –, we show that it is not necessarily disruptive. We use a unique, detailed micro-level dataset that tracks teams and their performance in Private Equity industry for over two decades. Private Equity is an ideal setting to study this question given the importance of human capital in the industry. Private Equity firms are organized as partnerships, wherein teams of individuals are responsible for each investment the PE firm makes. The simple organizational structure of the PE firms allows for meaningful comparisons across teams.

We show that turnover (whether measured by looking mainly at people leaving, or both at people leaving and joining) can affect future performance positively. Turnover can help eliminate worse performing individuals and update PE teams and adapt to changing business conditions. We provide evidence in support of both channels. These results also suggest that frictions may lead to stable teams even though a change in team composition might be optimal. One such friction may be information asymmetries between managers

and investors: if a firm is not good at choosing the right team, investors may doubt the overall credibility of the manager to generate returns.

These results are surprising given the common belief in the PE industry that team stability is key to continued performance, and suggest that a “narrow” focus on team stability may not necessarily lead to optimal investment decisions. Moreover, such beliefs may exacerbate agency problems allowing (even the under-performing) employees to capture higher rents, in the presence of moral hazard (Biais and Landier, 2013). Such agency rents are particularly relevant for the private equity industry, given the opacity in the industry, which results in more severe information asymmetries between insiders and outside investors.

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Figure 1: Number of Private Equity professionals hired/deperted

This figure shows the number of Private Equity professionals hired (positive values) and departed (negative values) in our sample between 1986-2011. It also plots the number of professionals with financial skills (light grey column) and operational skills (white column) hired/ departed during our sample period.

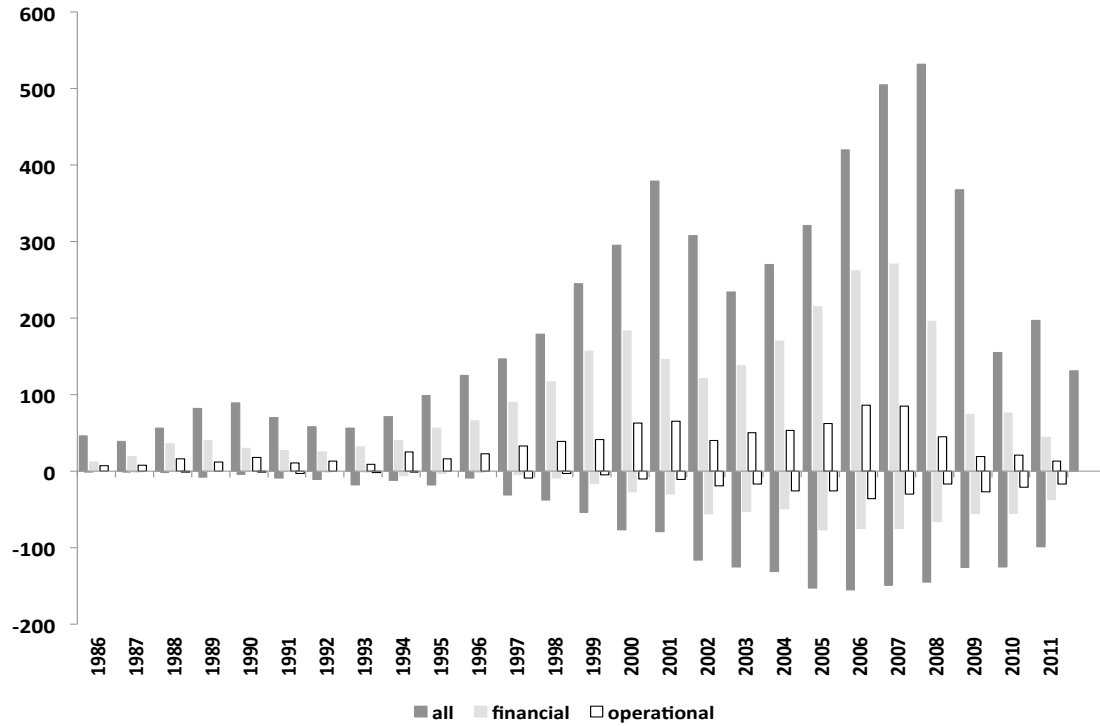


Figure 2: Number of Total and Written-off Deals

This figure presents the number of deals invested during our sample period per investment year. The dark grey column presents the total number of deals and the light grey column presents the deals invested that were eventually written-off. The lower numbers in the latter part of the sample are due to the fact that there is an increasing number of unrealized deals in that latter period.

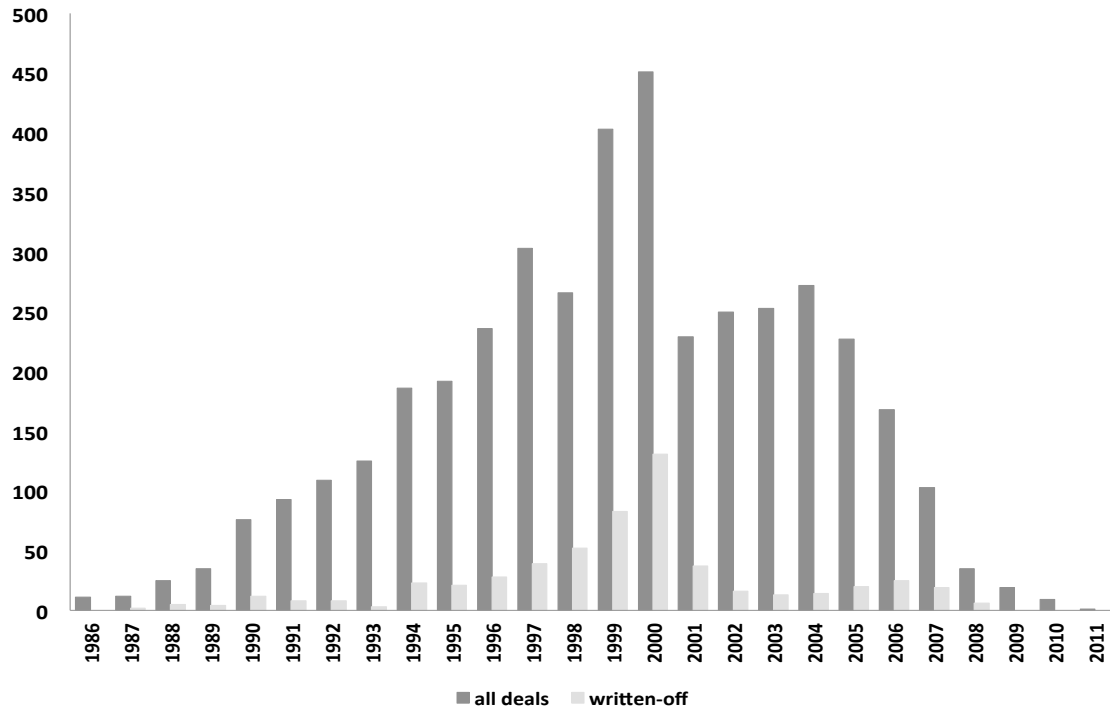


Figure 3: Percentage of Deals Across Countries

This figure presents the distribution of deals across countries in our sample. The x-axis presents the countries with the highest frequency of deals in our sample and the y-axis shows the percentage of deals based at a given country. Our sample covers the period 1986-2011.

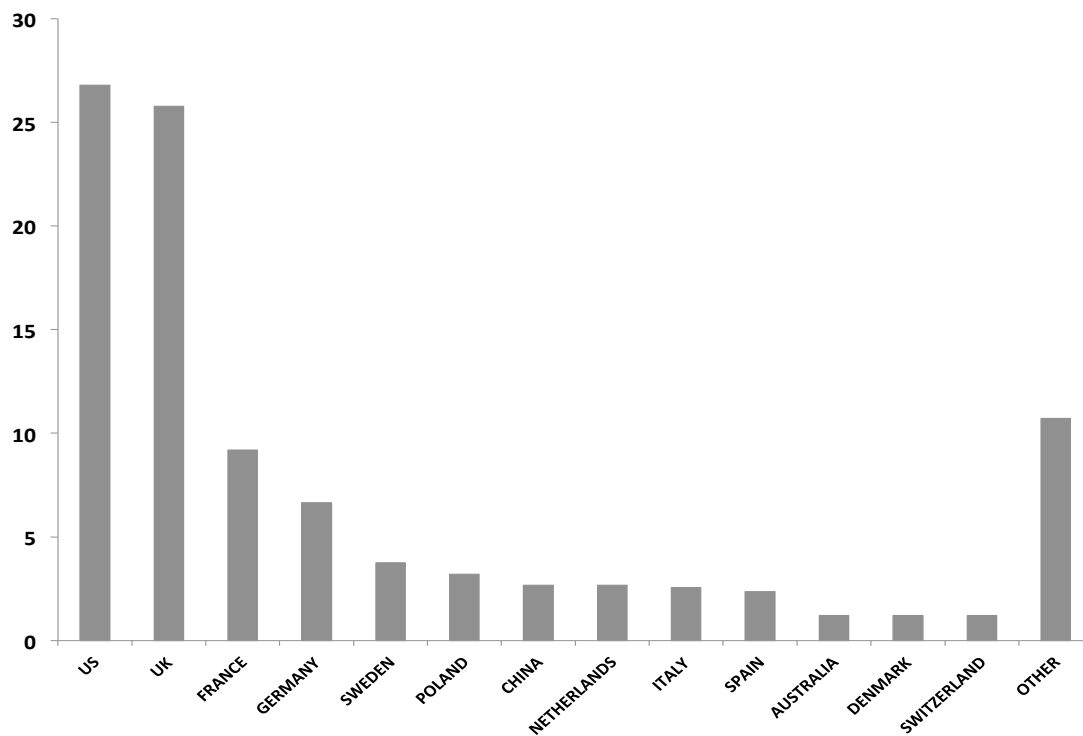


Table 1: Summary statistics

This table reports summary statistics for individual characteristics (Panel A), for deal-level team characteristics (Panel B), and for PE team characteristics (Panel C). In Panel A, *MBA* is a dummy that takes a value of 1 if the professional holds an MBA degree. *Operational (Financial)* takes a value of 1 if the individual has operational (financial) skills. *Keyman* takes a value of 1 if the individual is covered by a key man clause, and *Carry* takes a value of 1 if the individual is entitled to carry. *Rank* takes lower values if the individual holds more senior job positions within the organization. *Tenure* refers to the number of years the individual has been with the firm. These statistics are based on the sample of individuals for which we observe deal attribution information. In Panel B, *Turnover* is a dummy which takes a value of 1 if a team member leaves the PE firm during the duration of the deal, and 0 otherwise. *Size* refers to the number of professionals in each deal-team. *Age* is the average age of individuals in the team. *Experience* reports the number of years the average team member has been working for the PE firm at the time of the deal. *Busy* reports the number of investments the average team member started working on at the time of the investment. *Keymen* reports the % of team members which are covered by a key man clause. *Carry* reports the percentage of deal members entitled to carry. *Operational (Financial)* measures the percentage of the deal-team members with operational (financial) skills. *MBA* measures the percentage of deal members who hold an MBA degree. Panel C presents information on the size of the PE teams, the number of professionals with operational, financial skills, those entitled to carry or those who are part of the key man clause, and the number of individuals departed. Sample period: 1986-2011.

| Panel A: Individual Characteristics | | | | | | |
|---|---------------------|---------|---------|--------------------|--------------------|--------------------|
| | % of Individuals | Average | St. Dev | 25th percentile | 50th percentile | 75th percentile |
| MBA | 28.7 | 0.28 | 0.45 | 0 | 0 | 1 |
| Operational | 20 | 0.21 | 0.40 | 0 | 0 | 0 |
| Financial | 48 | 0.52 | 0.50 | 0 | 1 | 1 |
| Keyman | 8 | 0.08 | 0.27 | 0 | 0 | 0 |
| Carry | 32 | 0.31 | 0.46 | 0 | 0 | 1 |
| Date of Birth | – | 1966 | 41.09 | 1961 | 1969 | 1974 |
| Rank | – | 2 | 1.24 | 1 | 2 | 3 |
| Tenure | – | 5.26 | 4.78 | 2 | 4 | 7 |
| Panel B: Deal Team-level Characteristics | | | | | | |
| Turnover | | 0.21 | 0.41 | 0 | 0 | 0 |
| Size | | 2.68 | 1.74 | 2 | 2 | 3 |
| Age | | 37.42 | 5.88 | 33.5 | 37 | 41 |
| Experience | | 6.03 | 3.97 | 3 | 5.5 | 8 |
| Busy | | 2.19 | 1.76 | 1 | 1.75 | 2.5 |
| Keymen | | 0.23 | 0.33 | 0 | 0 | 0.5 |
| Carry | | 0.44 | 0.42 | 0 | 0.4 | 1 |
| Operational | | 0.21 | 0.31 | 0 | 0 | 0.33 |
| Financial | | 0.44 | 0.38 | 0 | 0.5 | 0.75 |
| MBA | | 0.31 | 0.36 | 0 | 0.18 | 0.5 |
| Panel B: PE Team Characteristics | | | | | | |
| Size | | 49 | 42.8 | 19 | 32 | 67 |
| Operational | | 7 | 6 | 2 | 5 | 9 |
| Financial | | 16 | 10 | 8 | 14 | 22 |
| Keyman | | 2.62 | 3.33 | 0 | 1 | 5 |
| Carry | | 10.52 | 11.5 | 0 | 9 | 15 |
| Number of Departures | | 12.53 | 12.82 | 3 | 8 | 18 |

Table 2: Summary statistics

This table reports summary statistics for deal-level characteristics (Panel A) and fund-level characteristics (Panel B). *Written-off Deal* is a dummy which takes a value of 1 if a deal is eventually written-off, and 0 otherwise. *Holding Period* is the duration of the investment (in years). *Ownership* is the percentage of the company owned by the PE firm. In Panel B, *size* is the size of closed funds in million dollars. $Turnover_{(t,t+5)}$ is the average number of team members who leave and join the private equity team normalized by the size of the team, computed over a five-year period at the start of each fund. $Turnover_{(t-5,t-1)}$ is the average number of team members who leave and join the private equity team normalized by the size of the team, computed over a five-year period prior to the start of each fund.

| Panel A: Deal-level Characteristics | | | | | |
|--|---------|---------|-----------------|-----------------|-----------------|
| | Average | St. Dev | 25th percentile | 50th percentile | 75th percentile |
| IRR (%) | 36 | 95 | 0 | 25 | 57 |
| Multiple (x) | 2.81 | 3.08 | 0.95 | 2.08 | 3.5 |
| Written-off Deal | 0.14 | 0.35 | 0 | 0 | 0 |
| Holding Period | 5.52 | 4.09 | 3 | 4.83 | 7.25 |
| Ownership (%) | 48 | 29 | 22 | 49 | 72 |
| Panel B: Fund-level Characteristics | | | | | |
| IRR (%) | 14.44 | 14.28 | 5.9 | 11.95 | 20.7 |
| Multiple (x) | 1.61 | 0.71 | 1.15 | 1.48 | 1.90 |
| DPI (%) | 107 | 93.9 | 26.6 | 94.3 | 167 |
| Size (\$mil.) | 1,625 | 2,610 | 286.9 | 715 | 1,800 |
| Turnover_(t,t+5) (%) | 13.40 | 8.87 | 6.83 | 12.61 | 19.34 |
| Turnover_(t-5,t-1) (%) | 18.82 | 11.25 | 12.08 | 16.67 | 23.29 |

Table 3: Turnover and deal performance: A naive approach

This table reports regressions of performance of deals with turnover (*Deals with turnover*), namely deals where individuals involved leave the PE firm during the investment of the deal, as compared to other deals within the same manager. All control variables are defined in Tables 1 and Table 2. All regressions include robust standard errors clustered at the fund manager level. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

| | IRR | | | |
|------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | (1) | (2) | (3) | (4) |
| <i>Turnover_{it}</i> | -0.233 (0.0432)*** | -0.219 (0.0407)*** | -0.0975 (0.0376)** | -0.0746 (0.0513) |
| <i>Size</i> | | | | 0.0398 (0.0179)** |
| <i>Age</i> | | | | -0.0021 (0.0045) |
| <i>Experience</i> | | | | 0.0046 (0.0064) |
| <i>Busy</i> | | | | 0.0727 (0.0216)*** |
| <i>Keymen</i> | | | | 0.197 (0.0752)** |
| <i>Carry</i> | | | | 0.0402 (0.0996) |
| <i>Operational</i> | | | | -0.0791 (0.0953) |
| <i>Financial</i> | | | | -0.0234 (0.0796) |
| <i>MBA</i> | | | | 0.0944 (0.0742) |
| <i>Ownership</i> | | | | -0.0203 (0.0285) |
| Fund Manager FE | Yes | Yes | Yes | Yes |
| Inv. Year | Yes | | | |
| Inv. Year*Region FE | | Yes | Yes | Yes |
| Exit Year*Region FE | | | Yes | Yes |
| R^2 | 0.14 | 0.18 | 0.24 | 0.29 |
| Obs. | 4,028 | 3,299 | 3,299 | 2,186 |

Table 4: Who is more likely to leave?

This table reports a probit regression which examines the determinants of a person leaving the PE firm. The dependent variable takes a value of 1 if an individual left the PE firm, and 0 otherwise. *Indiv. Performance* is the estimated coefficients of the individual effects from an OLS regression of performance (IRR) on individual effects, investment-year/region effects, exit-year/region effects, and fund manager fixed effects. All control variables are defined in Table 1. All regressions include robust standard errors clustered at the fund manager level. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

| | Individual leaves PE firm | | | |
|---------------------------|---------------------------|----------------------|-----------------------------|----------------------|
| | all deals | | exclude deals with turnover | |
| | (1) | (2) | (3) | (4) |
| <i>Indiv. Performance</i> | -0.196 (0.070)*** | -0.194 (0.091)** | -0.175 (0.075)** | -0.153 (0.085)* |
| <i>Keyman</i> | | -0.337 (0.150)** | | -0.250 (0.160) |
| <i>Carry</i> | | -0.805 (0.160)*** | | -0.882 (0.172)*** |
| <i>Operational</i> | | 0.274 (0.106)*** | | 0.231 (0.109)** |
| <i>Financial</i> | | 0.012 (0.083) | | -0.010 (0.082) |
| <i>MBA</i> | | -0.090 (0.101) | | -0.136 (0.112) |
| <i>Rank</i> | | -0.060 (0.061) | | -0.112 (0.063)* |
| Fund Manager FE | Yes | Yes | Yes | Yes |
| R^2 | 0.09 | 0.14 | 0.09 | 0.16 |
| Obs. | 2,055 | 1,627 | 1,595 | 1,278 |

Table 5: Deal performance of leavers and joiners

This table reports regressions of performance of deals attributed to individuals new to PE firms (*Deals of joiners*) or to individuals who leave the PE firm during or after the life of the deal (*Deals of leavers*), as compared to other deals within the same manager. All control variables are defined in Table 1 and Table 2. Columns 1-3 include and Columns 4-6 exclude deals which experience turnover due to a team member leaving during the life of the deal. All regressions include robust standard errors clustered at the fund manager level. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

| | IRR | | | | | |
|-------------------------|-----------------------|-----------------------|-----------------------|----------------------|-----------------------|-----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| <i>Deals of joiners</i> | 0.0934 (0.0543)* | | 0.0950 (0.0552)* | 0.108 (0.0574)* | | 0.112 (0.0600)* |
| <i>Deals of leavers</i> | | -0.117 (0.0537)** | -0.118 (0.0535)** | | -0.147 (0.0644)** | -0.150 (0.0642)** |
| <i>Size</i> | 0.0271 (0.0154)* | 0.0424 (0.0166)** | 0.0348 (0.0156)** | 0.0316 (0.0144)** | 0.0508 (0.0165)*** | 0.0426 (0.0157)*** |
| <i>Age</i> | -0.0029 (0.0046) | -0.0018 (0.0045) | -0.0024 (0.0044) | -0.0037 (0.0045) | -0.0024 (0.0044) | -0.0033 (0.0044) |
| <i>Experience</i> | 0.0135 (0.0091) | 0.0065 (0.0064) | 0.0151 (0.0089)* | 0.0108 (0.0087) | 0.0032 (0.0068) | 0.0131 (0.0087) |
| <i>Busy</i> | 0.0703 (0.0217)*** | 0.0707 (0.0221)*** | 0.0687 (0.0222)*** | 0.0502 (0.0220)** | 0.0519 (0.0223)** | 0.0493 (0.0225)** |
| <i>Keymen</i> | 0.197 (0.0762)** | 0.179 (0.0697)** | 0.179 (0.0706)** | 0.190 (0.0817)** | 0.167 (0.0753)** | 0.168 (0.0757)** |
| <i>Carry</i> | 0.0605 (0.0960) | 0.0419 (0.0993) | 0.0393 (0.0986) | 0.0933 (0.100) | 0.0702 (0.101) | 0.0672 (0.100) |
| <i>Operational</i> | -0.0748 (0.0950) | -0.0717 (0.0954) | -0.0677 (0.0950) | -0.0822 (0.116) | -0.0801 (0.116) | -0.0736 (0.116) |
| <i>Financial</i> | -0.0142 (0.0806) | -0.0164 (0.0807) | -0.0106 (0.0816) | -0.0546 (0.0975) | -0.0552 (0.0972) | -0.0525 (0.0976) |
| <i>MBA</i> | 0.100 (0.0744) | 0.0939 (0.0755) | 0.0978 (0.0758) | 0.0753 (0.0783) | 0.0624 (0.0799) | 0.0673 (0.0796) |
| <i>Ownership</i> | -0.0222 (0.0284) | -0.0181 (0.0284) | -0.0203 (0.0283) | -0.0366 (0.0295) | -0.0322 (0.0293) | -0.0348 (0.0292) |
| Fund Manager FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Inv. Year*Region FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Exit Year*Region FE | Yes | Yes | Yes | Yes | Yes | Yes |
| R^2 | 0.29 | 0.30 | 0.30 | 0.31 | 0.31 | 0.31 |
| Obs. | 2,186 | 2,186 | 2,186 | 1,886 | 1,886 | 1,886 |

Table 6: Turnover and (short-term) fund performance

This table examines the effect of PE team turnover on fund performance. Fund performance is measured as the logarithm of IRR and is the performance of fund k in Columns 1, 4, the average performance of the current fund k and the subsequent fund $(k + 1)$ in Columns 2, 5, the average performance of the current fund k and the subsequent two funds $(k + 1, k + 2)$ in Columns 3, 6. *Turnover (leavers)* $_{jk,(t,t+5)}$ is the average number of team members who leave the private equity team normalized by the size of the team, computed over a five-year period (between t and $t + 5$) following vintage year t of fund k . *Turnover (leavers+joiners)* $_{jk,(t,t+5)}$ is the average number of team members who join and leave the private equity team normalized by the size of the team, computed over a five-year period (between t and $t + 5$) following vintage year t of fund k . *Team Growth* is defined as the growth rate of the size of the team between t and $t + 5$. *Team Size* is the logarithm of the size of the team of the fund manager at time t , and *Team Size Squared* is its squared term. *Size* is the dollar amount of capital under management by a given fund (log-transformed). The funds included in the analysis have vintage years greater than 1995. All regressions include robust standard errors clustered at the fund manager level. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

| | IRR | | | | | |
|---|----------------------|----------------------|----------------------|-----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| <i>Turnover (leavers)</i> $_{jk,(t,t+5)}$ | 0.0441 (0.0215)** | 0.0210 (0.0100)** | 0.0164 (0.0086)* | | | |
| <i>Turnover (leavers+joiners)</i> $_{jk,(t,t+5)}$ | | | | 0.0258 (0.0102)*** | 0.0127 (0.0054)** | 0.0106 (0.0048)** |
| <i>Team Growth</i> | 0.0191 (0.093) | -0.044 (0.046) | -0.037 (0.037) | -0.052 (0.080) | -0.079 (0.049) | -0.066 (0.040) |
| <i>Team Size</i> | -0.174 (0.609) | -0.473 (0.335) | -0.265 (0.282) | -0.107 (0.613) | -0.444 (0.338) | -0.242 (0.287) |
| <i>Team Size Squared</i> | -0.0280 (0.092) | 0.024 (0.048) | -0.001 (0.041) | -0.011 (0.095) | 0.033 (0.048) | 0.006 (0.041) |
| <i>Size</i> | -0.088 (0.056) | -0.065 (0.023)*** | -0.058 (0.020)*** | -0.071 (0.051) | -0.056 (0.021)*** | -0.051 (0.019)*** |
| Fund Manager FE | Yes | Yes | Yes | Yes | Yes | Yes |
| R^2 | 0.35 | 0.59 | 0.64 | 0.36 | 0.60 | 0.65 |
| Obs. | 453 | 453 | 453 | 453 | 453 | 453 |

Table 7: Turnover and (long-term) fund performance

This table examines the effect of PE team turnover on fund performance. Fund performance is measured as the logarithm of IRR and is the performance of fund k in Columns 1, 3, the average performance of the current fund k and the subsequent fund $(k + 1)$ in Columns 2, 4. $Turnover (leavers)_{jk,(t-5,t-1)}$ is the average number of team members who leave the private equity team normalized by the size of the team, computed over a five-year period (between $t - 1$ and $t - 5$) preceding vintage year t of fund k . $Turnover (leavers+joiners)_{jk,(t-5,t-1)}$ is the average number of team members who join and leave the private equity team normalized by the size of the team, computed over a five-year period (between $t - 5$ and $t - 1$) preceding vintage year t of fund k . The rest of the variables are defined as in Table 6. The funds included in the analysis have vintage years greater than 1995. All regressions include robust standard errors clustered at the fund manager level. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

| | IRR | | | |
|---|---------------------|-----------------------|----------------------|-----------------------|
| | (1) | (2) | (3) | (4) |
| $Turnover (leavers)_{jk,(t-5,t-1)}$ | -0.0368 (0.0258) | -0.0139 (0.0114) | | |
| $Turnover (leavers+joiners)_{jk,(t-5,t-1)}$ | | | 0.0091 (0.0038)** | 0.0056 (0.0025)** |
| <i>Team Growth</i> | -0.0128 (0.0785) | -0.0659 (0.0424) | -0.0173 (0.0798) | -0.0665 (0.0411) |
| <i>Team Size</i> | -0.266 (0.756) | -0.540 (0.454) | -0.0329 (0.664) | -0.426 (0.420) |
| <i>Team Size Squared</i> | -0.011 (0.115) | 0.033 (0.066) | -0.054 (0.098) | 0.014 (0.060) |
| <i>Size</i> | -0.0693 (0.0530) | -0.0569 (0.0220)** | -0.0768 (0.0547) | -0.0596 (0.0233)** |
| Fund Manager FE | Yes | Yes | Yes | Yes |
| R^2 | 0.35 | 0.59 | 0.35 | 0.59 |
| Obs. | 431 | 431 | 431 | 431 |

Table 8: Decomposing turnover

This table examines the effect of PE team turnover on fund performance. Fund performance is the logarithm of IRR and is the performance of fund k in Columns 1, 4, the average performance of the current fund k and the subsequent fund ($k + 1$) in Columns 2, 5, the average performance of the current fund k and the subsequent two funds ($k + 1$, $k + 2$) in Column 3. *Departures with replacement* is a dummy which takes a value of 1 if the sum of individuals replaced over a five-year period (between t and $t + 5$ in Columns 1-3 and between $t - 5$ and $t - 1$ in Columns 4-5) normalized by the size of the team, exceeds the median value, and is 0 otherwise. *Departures with no replacement* is a dummy which takes the value of 1 if the sum of individuals who left without being replaced over a five-year period (between t and $t + 5$ in Columns 1-3 and between $t - 5$ and $t - 1$ in Columns 4-5) normalized by the size of the team, exceeds the median value, and is 0 otherwise. *Additions to team* is a dummy which takes the value of 1 if the sum of additions to teams, over a five-year period (between t and $t + 5$ in Columns 1-3 and between $t - 5$ and $t - 1$ in Columns 4-5) normalized by the size of the team, exceeds the median value, and is 0 otherwise. t is the vintage year of fund k . The rest of the variables are defined as in Table 6. The funds included in the analysis have vintage years greater than 1995. All regressions include robust standard errors clustered at the fund manager level. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

| | IRR | | | | |
|--|---------------------|------------------------|------------------------|---------------------|-----------------------|
| | (1) | (2) | (3) | (4) | (5) |
| <i>Departures with replacement</i> $t_{jk,(t,t+5)}$ | 0.255 (0.144)* | 0.138 (0.0715)* | 0.122 (0.0615)** | | |
| <i>Departures with no replacement</i> $t_{jk,(t,t+5)}$ | 0.322 (0.193)* | 0.157 (0.102) | 0.109 (0.0942) | | |
| <i>Additions to team</i> $t_{jk,(t,t+5)}$ | -0.0325 (0.149) | -0.0752 (0.0718) | -0.0615 (0.0581) | | |
| <i>Departures with replacement</i> $t_{jk,(t-5,t-1)}$ | | | | -0.050 (0.112) | -0.014 (0.067) |
| <i>Departures with no replacement</i> $t_{jk,(t-5,t-1)}$ | | | | -0.088 (0.150) | -0.007 (0.074) |
| <i>Additions to team</i> $t_{jk,(t-5,t-1)}$ | | | | 0.285 (0.161)* | 0.174 (0.077)** |
| <i>Team Size</i> | -0.062 (0.578) | -0.370 (0.300) | -0.192 (0.262) | -0.307 (0.642) | -0.441 (0.374) |
| <i>Team Size Squared</i> | -0.0410 (0.0944) | 0.0148 (0.0481) | -0.006 (0.0429) | 0.0224 (0.106) | 0.0444 (0.0576) |
| <i>Size</i> | -0.083 (0.0560) | -0.0618 (0.0230)*** | -0.0542 (0.0200)*** | -0.0626 (0.0505) | -0.0495 (0.0211)** |
| Fund Manager FE | Yes | Yes | Yes | Yes | Yes |
| R^2 | 0.36 | 0.60 | 0.65 | 0.36 | 0.60 |
| Obs. | 453 | 453 | 453 | 431 | 431 |

Table 9: Mechanisms: Departures of bad performers

This table examines whether top managers, in terms of performance, are better able to fire underperforming team members. The dependent variable in Columns 1-2 is the ratio of underperforming individuals leaving the manager at a given year normalized by the number of bad performers in the team. The dependent variable in Columns 3-4 is the logarithm of one plus the number of bad performers in a given team-year, and in Columns 5-6 is the logarithm of one plus the number of bad performers leaving the team in a given team-year. We consider individuals to be bad performers if their median performance is lower than the median performance of the private equity team (based on deal attribution performance data). *Top Managers* is a time-varying variable, which takes a value of 1 if PE firms' funds prior performance is above the sample median, and 0 otherwise. *Size* is a time-varying variable, which is 1 if PE firms' funds prior fund size is above the sample median, and 0 otherwise. All regressions include robust standard errors clustered at the fund manager level. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

| | Share of bad performers leaving | | Log(1+bad performers) | | Log(1+bad performers leaving) | |
|---------------------|---------------------------------|---------------------|-----------------------|--------------------|-------------------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| <i>Top Managers</i> | 0.9022 (0.4617)** | 0.9015 (0.4884)* | -0.0097 (0.0968) | -0.0140 (0.106) | 0.0677 (0.0284)** | 0.0581 (0.0291)** |
| <i>Size</i> | | 0.0026 (0.4520) | | 0.0191 (0.105) | | 0.0430 (0.0261)* |
| Fund Manager FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| R^2 | 0.13 | 0.13 | 0.80 | 0.81 | 0.25 | 0.25 |
| Obs. | 1,214 | 1,214 | 1,270 | 1,270 | 1,270 | 1,270 |

Table 10: Mechanisms: Team adaptability

This table examines whether top managers, in terms of performance, change their team composition following recessions. The dependent variable in Columns 1-2 is the ratio of individuals with operational skills in the team at a given year normalized by the size of the team. The dependent variable in Columns 3-4 is the number of individuals with operational skills joining and leaving the PE team at a given year normalized by the size of the team. Recession is a dummy which takes a value of 1 if there is a recession in a given region and year (lagged by one year). We consider a region to be in recession if GDP growth rate is negative for three consecutive quarters in the region. *Top Managers* is a time-varying variable, which takes a value of 1 if PE firms' funds prior performance is above the sample median, and 0 otherwise. *Size* is a time-varying variable, which is 1 if PE firms' funds prior fund size is above the sample median, and 0 otherwise. All regressions include robust standard errors clustered at the fund manager level. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

| | Share of operational skills | | Operational turnover | |
|--|-----------------------------|-----------------------|----------------------|---------------------|
| | (1) | (2) | (3) | (4) |
| <i>Top Managers</i> | -0.0252 (0.0112)** | -0.0229 (0.0107)** | -0.0046 (0.0042) | -0.0043 (0.0044) |
| <i>Top Managers</i> × <i>Recession</i> _{<i>t</i>-1} | 0.0152 (0.0071)** | 0.0156 (0.0071)** | 0.0098 (0.0054)* | 0.0098 (0.0054)* |
| <i>Recession</i> _{<i>t</i>-1} | -0.0192 (0.0112)* | -0.0195 (0.0113)* | -0.0024 (0.0060) | -0.0024 (0.0060) |
| <i>Size</i> | | -0.0119 (0.0143) | | -0.0013 (0.0036) |
| Fund Manager FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| R^2 | 0.79 | 0.79 | 0.31 | 0.31 |
| Obs. | 1,270 | 1,270 | 1,270 | 1,270 |

Table 11: Leavers turnover: Skill and seniority

This table examines the effect of PE team turnover on fund performance. Fund performance is the logarithm of IRR (defined as in Table 6). $Turnover (leavers)_{jk,(t,t+5)}$ is the average number of team members who leave the private equity team normalized by the size of the team, computed over a five-year period (between t and $t + 5$) following vintage year t of fund k . $Turnover (leavers) Skilled_{jk,(t,t+5)}$ is the average number of key men and $Turnover (leavers) Senior_{jk,(t,t+5)}$ the average number of individuals with high job tenure (those who have been with the firm for more that 6 years), who leave the private equity team normalized by the size of the team, computed over a five-year period (between t and $t + 5$) following vintage year t of fund k . The rest of the variables are defined as in Table 6. The funds included in the analysis have vintage years greater than 1995. All regressions include robust standard errors clustered at the fund manager level. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

| | IRR | | | | | |
|---|----------------------|------------------------|------------------------|----------------------|-----------------------|-----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $Turnover (leavers)_{jk,(t,t+5)}$ | 0.0546 (0.0233)** | 0.0285 (0.0112)** | 0.0235 (0.0095)** | 0.0590 (0.0276)** | 0.0316 (0.0146)** | 0.0291 (0.0128)** |
| $Turnover (leavers)_{jk,(t,t+5)} * Turnover (leavers) Skilled_{jk,(t,t+5)}$ | -0.0154 (0.0091)* | -0.0111 (0.0044)*** | -0.0104 (0.0038)*** | | | |
| $Turnover (leavers)_{jk,(t,t+5)} * Turnover (leavers) Senior_{jk,(t,t+5)}$ | | | | -0.364 (0.307) | -0.258 (0.153)* | -0.309 (0.132)** |
| <i>Team Growth</i> | 0.0132 (0.0883) | -0.0483 (0.0462) | -0.0414 (0.0366) | 0.0145 (0.0883) | -0.0478 (0.0466) | -0.0421 (0.0385) |
| <i>Team Size</i> | -0.267 (0.608) | -0.531 (0.340) | -0.319 (0.285) | -0.289 (0.619) | -0.558 (0.354) | -0.366 (0.305) |
| <i>Team Size Squared</i> | -0.0135 (0.0929) | 0.0326 (0.0486) | 0.0071 (0.0418) | -0.0108 (0.0957) | 0.0363 (0.0515) | 0.0137 (0.0456) |
| <i>Size</i> | -0.0767 (0.0546) | -0.0565 (0.0222)** | -0.0499 (0.0189)*** | -0.0803 (0.0555) | -0.0592 (0.0233)** | -0.0510 (0.0202)** |
| Fund Manager FE | Yes | Yes | Yes | Yes | Yes | Yes |
| R^2 | 0.36 | 0.60 | 0.65 | 0.35 | 0.59 | 0.65 |
| Obs. | 453 | 453 | 453 | 453 | 453 | 453 |

Appendix

In Table A1, Columns 1-3, we repeat specifications in Columns 2-4, Table 3, using multiples as the measure of performance. Multiple, defined as the total amount distributed divided by total amount invested, is a common measure used in the industry to evaluate performance. Given multiples do not take into account the length of the investment period, we include the length of the deal holding period (log transformed) throughout our specifications. The results are robust to using multiples as a measure of performance.

Columns 4-6, Table A1, use instead information on the status of the deal to measure performance. Specifically, the dependent variable is a dummy that takes a value of 1 if the investment is eventually written-off, namely it exhibits negative performance, and 0 otherwise. Similar to Columns 1-3, we additionally include throughout the specifications the logarithm of the deal holding period as a control variable. The results of the linear probability model are consistent with our previous findings: deals with turnover are more likely to be written-off compared to deals of the same fund manager sourced and exited at the same region and year that did not experience turnover. The probability of a write-off increases by 3% (Column 4) for deals with turnover and the effect is robust to including various controls.

Table A2 provides instead robustness on fund level results. Thus, we repeat Table 6, using alternative measures of fund performance as our dependent variable. In Panel A, we use multiples and in Panel B, we use dpi, or distribution to paid in ratios (both winsorized at 1% level) to measure fund level performance. The results are robust to including these alternative measures of performance. Across specifications, the coefficients are positive and statistically significant at 1% level. The results are also economically meaningful: An increase of leavers' turnover by 1 percentage point, is associated with 5% higher multiple (Column 1, Panel A).

Figure A1: Histogram of individual fixed effects

This figure shows the histogram of the estimated coefficients of the individual effects from an OLS regression of performance (measured by IRR) on individual fixed effects, investment-year/region fixed effects, exit-year/region fixed effects, and fund manager fixed effects.

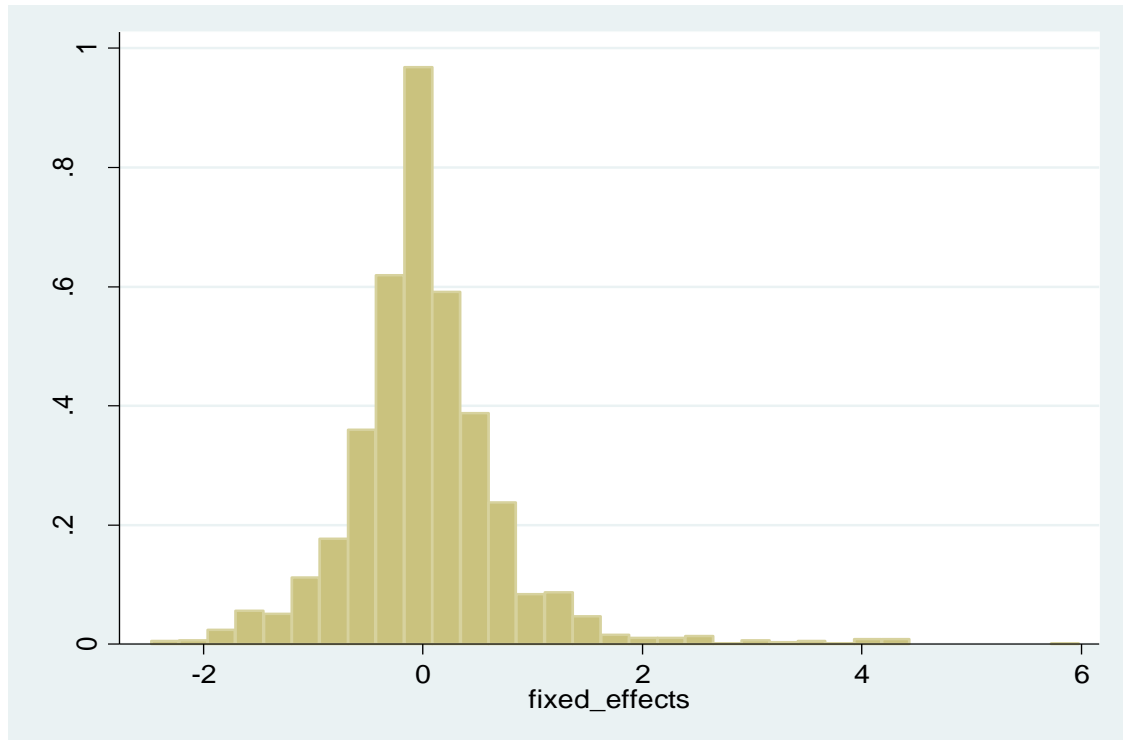


Table A1: Turnover and alternative measures of deal level performance

This table reports regressions of performance of deals with turnover (*Deals with turnover*), namely deals where individuals involved leave the PE firm during the investment of the deal, as compared to other deals within the same manager. Performance in Columns 1-3 is measured with multiples and in columns 4-6 with the probability of the deal being written-off. All control variables are defined in Table 1 and Table 2. All regressions include robust standard errors clustered at the fund manager level. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

| | Multiple | | | Prob(Written-off deal) | | |
|----------------------------|----------------------|---------------------|---------------------|------------------------|-----------------------|------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| <i>Deals with turnover</i> | -0.479 (0.148)*** | -0.398 (0.153)** | -0.262 (0.183) | 0.0328 (0.0150)** | 0.0222 (0.0164) | 0.0342 (0.0166)** |
| <i>Holding period</i> | 0.290 (0.168)* | 1.692 (0.358)*** | 1.749 (0.456)*** | -0.0809 (0.0334)** | -0.318 (0.0638)*** | -0.260 (0.0692)*** |
| <i>Size</i> | | | 0.0932 (0.0486)* | | | -0.0303 (0.0099)*** |
| <i>Age</i> | | | 0.0117 (0.0195) | | | 0.0029 (0.0018) |
| <i>Experience</i> | | | 0.0070 (0.0236) | | | -0.0042 (0.0031) |
| <i>Busy</i> | | | 0.0657 (0.0569) | | | -0.0039 (0.0111) |
| <i>Keymen</i> | | | 0.343 (0.361) | | | -0.0608 (0.0350)* |
| <i>Carry</i> | | | 0.821 (0.469)* | | | -0.0419 (0.0413) |
| <i>Operational</i> | | | -0.170 (0.292) | | | 0.0534 (0.0366) |
| <i>Financial</i> | | | 0.0878 (0.339) | | | 0.0125 (0.0315) |
| <i>MBA</i> | | | 0.445 (0.318) | | | -0.0351 (0.0279) |
| <i>Ownership</i> | | | -0.0238 (0.0762) | | | 0.0108 (0.0075) |
| Fund Manager FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Inv. Year*Region FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Exit Year*Region FE | | Yes | Yes | | Yes | Yes |
| R^2 | 0.15 | 0.18 | 0.24 | 0.15 | 0.20 | 0.24 |
| Obs. | 3,348 | 3,348 | 2,226 | 3,349 | 3,349 | 2,226 |

Table A2: Turnover and alternative measures of fund performance

This table examines the effect of PE team turnover on fund performance. Fund performance is measured as multiples in Panel A and DPI in Panel B, and is the performance of fund k in Columns 1, 4, the average performance of the current fund k and the subsequent fund $(k + 1)$ in Columns 2, 5, the average performance of the current fund k and the subsequent two funds $(k + 1, k + 2)$ in Columns 3, 6. $Turnover (leavers)_{jk,(t,t+5)}$ is the average number of team members who leave the private equity team normalized by the size of the team, computed over a five-year period (between t and $t + 5$) following vintage year t of fund k . $Turnover (leavers+joiners)_{jk,(t,t+5)}$ is the average number of team members who join and leave the private equity team normalized by the size of the team, computed over a five-year period (between t and $t + 5$) following vintage year t of fund k . The rest of the variables are defined as in Table 6. The funds included in the analysis have vintage years greater than 1995. All regressions include robust standard errors clustered at the fund manager level. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$.

| | Panel A: Multiple | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $Turnover (leavers)_{jk,(t,t+5)}$ | 0.0456 (0.0141)*** | 0.0350 (0.0102)*** | 0.0222 (0.0072)*** | | | |
| $Turnover (leavers+joiners)_{jk,(t,t+5)}$ | | | | 0.0233 (0.0070)*** | 0.0159 (0.0051)*** | 0.0095 (0.0036)*** |
| <i>Team Growth</i> | -0.078 (0.105) | -0.173 (0.105) | -0.151 (0.075)** | -0.154 (0.097) | -0.231 (0.119)* | -0.186 (0.085)** |
| <i>Team Size</i> | -0.781 (0.574) | -1.191 (0.576)** | -0.884 (0.434)** | -0.731 (0.573) | -1.157 (0.588)* | -0.864 (0.449)* |
| <i>Team Size Squared</i> | 0.005 (0.081) | 0.058 (0.074) | 0.029 (0.059) | 0.020 (0.084) | 0.067 (0.075) | 0.034 (0.061) |
| <i>Size</i> | -0.084 (0.028)*** | -0.077 (0.025)*** | -0.067 (0.022)*** | -0.068 (0.029)** | -0.066 (0.023)*** | -0.060 (0.022)*** |
| Fund Manager FE | Yes | Yes | Yes | Yes | Yes | Yes |
| R^2 | 0.46 | 0.66 | 0.74 | 0.47 | 0.66 | 0.74 |
| Obs. | 511 | 511 | 511 | 511 | 511 | 511 |

Table A2 - Continued

| | Panel B: DPI | | | | | |
|--|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| <i>Turnover (leavers)</i> _{<i>jk,(t,t+5)</i>} | 8.252 (1.881)*** | 6.284 (1.660)*** | 4.340 (1.402)*** | | | |
| <i>Turnover (leavers+joiners)</i> _{<i>jk,(t,t+5)</i>} | | | | 4.545 (0.976)*** | 3.371 (0.843)*** | 2.339 (0.729)*** |
| <i>Team Growth</i> | -17.69 (13.98) | -25.67 (12.04)** | -22.75 (8.92)** | -32.02 (12.56)** | -36.77 (14.17)** | -30.43 (10.63)*** |
| <i>Team Size</i> | -142.7 (71.72)** | -144.8 (69.16)** | -92.12 (53.55)* | -133.5 (70.39)* | -138.1 (70.28)* | -87.45 (55.04) |
| <i>Team Size Squared</i> | -0.456 (10.41) | -0.348 (9.684) | -5.491 (7.772) | 2.668 (11.02) | 1.882 (9.841) | -3.940 (7.875) |
| <i>Size</i> | -15.86 (4.250)*** | -13.13 (3.741)*** | -12.33 (3.155)*** | -12.76 (3.935)*** | -10.82 (3.287)*** | -10.72 (2.891)*** |
| Fund Manager FE | Yes | Yes | Yes | Yes | Yes | Yes |
| <i>R</i> ² | 0.62 | 0.73 | 0.78 | 0.64 | 0.75 | 0.79 |
| Obs. | 513 | 513 | 513 | 513 | 513 | 513 |