Team Stability and Performance: Evidence from Private Equity

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Abstract

We examine the relation between team turnover and firm 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. 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.

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). As a result, attracting and retaining key talent is one of the main challenges currently grappling many organizations (Garmaise, 2009; Ouimet and Zarutskie, 2015; Tate and Yang, 2016).[1] As individuals typically work in teams, retaining key talent is often associated with maintaining team stability in the organization. Although team stability may have arguably many desirable outcomes, it is an open question whether organizations go too far in the pursuit of stability. In this paper, we empirically study the effect of team stability on performance in a team production environment.

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 members' 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. Some individuals may not perform as well as others, and it may be optimal to replace them. Even if some individuals are highly skilled and were originally performing well, they may no more be the right match to the firm as its activities and/or focus changes, and thus the firm would be better off finding a better fit for the role (Jovanovich, 1979; McLaughlin, 1991). New people joining a team also bring fresh ideas and a new set of skills (March, 1991). Team members who have been working

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together for a very long time may just reinforce each other beliefs, rather than taking a new point of view. This need for new ideas and skills is especially important in scenarios in which teams are operating in a changing environment that requires firms to adapt. A very stable team may not be able to take advantage of the new opportunities. In addition, new hires of skilled, high productivity employees can also have positive spillover 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).

Studying the relation between team stability and 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. It is also often difficult to identify an individual's contribution in an organization. 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. For example, it is quite common for investors to use "key-man" clauses, which govern what happens when a person essential to the fund leaves.[2]

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[2]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. 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

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 information also on the due diligence of the funds in which the fund-of-fund ultimately decided not to invest, alleviating selection concerns. 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, and performance is clearly measured by the return of each investment. We are also 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. Finally, private equity funds have a clearly defined sequential structure which we can exploit to mitigate reverse causality issues.

We start by looking at whether turnover is indeed associated with worse future performance. To the extent that the turnover is optimally chosen by the PE firm, in equilibrium a firm should always choose the optimal turnover and thus we should observe no relation between turnover and performance. If instead some of the observed turnover is because

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from 2009. See http://www.bloomberg.com/news/articles/2012-04-02/first-reserve-s-mccomiskey-to-leave-as-co-head-of-buyouts.

people choose to leave (while the company would have wanted to retain them), then we should expect a negative effect. We find instead that higher turnover is associated to better future performance.

To gauge the relation between team turnover and performance, we use different definitions of turnover and different horizons. First, we define turnover as the average number of people 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 the subsequent fund within the same fund manager. Our intuition is that these results capture an immediate effect of replacing bad performers in the current fund, which thereby allows "fixing" performance of the current fund. Since the investments have already been made in the first 5 years, improvements can mainly be achieved through successful restructuring and exit of the invested deals. Naturally, the departure of the best performers is not as beneficial as the one of the underperforming ones. We show the positive effect on immediate performance is diminished when high-skilled employees, or employees with firm-specific human capital leave the firm.

We next examine a more long-term effect of turnover on performance at the time of raising the subsequent fund. 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 a fast-paced economic environment, team adaptability is key when PE firms need to make new investment decisions and raise the next fund. To study this hypothesis, we define turnover the average number of people joining and leaving the PE firm normalized by the size of the team over a five-year period before the start of a given fund.[3] 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

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[3]Looking at the difference between leavers and joiners may help us differentiate between the effect of replacing bad performers (the leavers) and the effect of new ideas and skills (brought by the joiners).

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 performance of the next fund. 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.

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. Our analysis is also robust to controlling for fund manager fixed effects which alleviates concerns that alternate stories specific to the managers can explain our findings.

To further document the two effects of turnover, an immediate effect on current fund performance and an effect on the next fund through team adaptability, 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 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 when PE firms raise their next fund.

As evidence that turnover allows PE companies to replace underperforming individuals, we show that deals attributed to individuals who subsequently left 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, while those attributed to people who recently joined are slightly overperforming. To strengthen the argument that turnover of underperforming individuals is forced by PE firms, we look at the reasons provided for departures. We show that past performance of individuals who subsequently left is negatively associated with the probability of staying in the PE industry, indicating that departures of underperforming people represent cases where the PE company forced them to leave.

To test the team adaptability channel, 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 (moreover, as leverage is less available during recessions, new investments will have to be more focused on operational restructuring). 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. This last finding is consistent with the idea that the operational skills required are the most likely to change with the cycle or with the sectors. To complement this finding, we examine the effect of turnover during recessions on subsequent performance. We show that funds that update their teams and replenish their skills during recessions perform better in their next fund.

The evidence so far shows that turnover is associated with an increase in future performance. As mentioned before, the optimal level of turnover in equilibrium implies no relationship with performance. Thus, an implication of our results is that there may be frictions that result in lower team turnover than it may be optimal. As such, informational problems between various parties may lead to stable teams even though a change in team composition might be optimal. The presence of asymmetric information between the firm management team and the investors may make the firm less willing to change the team because of a signal extraction problem. If the external investors cannot decipher whether the change in team composition reflects on the team ability or the changing external con-

ditions, this would make the management more reluctant to alter the team. 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. To document evidence in line with this argument, we identify two cases where the asymmetry of information is less severe. First, we show that top managers (based on past performance) are more likely to fire underperforming individuals. Second, we observe higher turnover at times when more fund deals are successfully exited, and thus information asymmetries are reduced.

Finally, we also present some evidence in support of a last type of friction: scarcity of resources (i.e. high skill individuals). In such case, a firm may not be willing to fire bad performers or attract new individuals with fresh ideas, if it thinks it has low chances to hire high skilled individuals.

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.[4] Several papers study private equity returns and the determinants of PE performance.[5] 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), Brown, Gredil and Kaplan (2016) and Barber and Yasuda (2016) show the importance of fundraising for the incentives to managers.

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[4]See 2015 Preqin Global Private Equity & Venture Capital Report.

[5]See Kaplan and Schoar, 2005; Phalippou, and Gottschalg, 2009; Higson and Stucke, 2012; Sensoy and Robinson, 2013; Harris, Jenkinson, and Kaplan, 2014.

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.

Finally, this paper is related to the literature on CEO turnover. Warner et al. (1988) and Denis and Denis (1995) show that unexpected departure of CEOs is associated with zero or positive abnormal returns. On the other hand, Israelsen and Yonker (2017) focus on "key employees" and find that the risk of losing key employees affects negatively firm values. While we also study some key employees as the key men, the focus of our paper is on team turnover (although the team in our case is entirely composed of high skilled employees).[6]

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 fund of

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[6]In the Organizational Behavior literature, Baron, 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.

funds 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. Before investing in a fund of a Private Equity manager, Capital Dynamics conducts a detailed examination of all the previous funds of the same managers 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 fund or not, so in our data we have due diligence also of the funds in which Capital Dynamics eventually decided not to invest. 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 deals (i.e. companies a fund has invested in), as well as information on deal attribution, or in other words, information on the individuals 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 (i.e. the fund has exited the investment), unrealized, or written-off investments. 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 information on 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 measures based on individual characteristics. The first measure 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 (in a company, or as consultants) outside the finance sector before joining the PE firm. The financial types are those who worked in finance before (mainly investment banking jobs or financial consultants). Other include all remaining categories such as law or accounting background (or those who joined immediately a PE firm, so that they cannot be categorized on the basis of the previous career).

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, as we find no discrepancy between the two data sources. 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. 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 team. 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 these smaller teams in charge of individual investments. 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. We do not observe whether an individual leaves a deal team to work on another deal within 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).

Throughout our analysis we exclude unrealized deals (1,659 in total), although our results are robust to including those deals. After excluding unrealized deals, we have data on 4,055 deals, 86% of which are realized, and 14% are written-off investments. 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.[7] 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

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

(median) fund in our sample has an IRR (net of fees) 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 (see Figure 4 for a visual representation). On average, funds close after 10 years. The typical life cycle of a fund includes sourcing/investing in deals, restructuring and exit. During the first 5 years of the fund 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 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 strategy or investment profile of the fund, as investments have already been made and there is only 5 years till exit, but can potentially improve performance and help exit successfully.

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

Moreover, funds tend typically to be overlapping with each other, since a new fund is 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. During this period, PE firms propose their investment thesis to potential investors with an emphasis to 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 focus on the success of the next fund, 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 effect of turnover on performance of the current fund discussed above, the effect here capitalizes on new ideas and skills of team members joining rather than on underperforming individuals leaving the PE firm. Moreover, the turnover in such cases is not revealing anything about the investments of fund k, since they have not been undertaken yet, and this mitigates reverse causality concerns.

To test the 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 j (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   Team turnover and fund performance

As discussed in the introduction, investors think that stability of the PE team is a recipe for success and make it a primary consideration before they invest. Therefore, implicit in their behavior is the belief that stability nurtures future good performance. Here, we start by looking at the relation between team turnover and fund performance. Is turnover indeed associated with worse performance in the future?

In theory, every PE company should choose the optimal level of turnover in equilibrium and thus we should not observe any statistically significant relation between turnover and

future performance. If turnover is voluntary (i.e. when the PE company chooses to change the team composition), then we should observe no correlation with performance (because it is the optimal level chosen by the company). If instead turnover is voluntary, we should identify a negative correlation (since people leave against the desire of the firm and the investors). In the analysis below, we will instead show that turnover is associated with better future performance, which is inconsistent with the view held by investors or with the equilibrium outcome, in the absence of frictions.

To understand better what may be driving this positive relation, we distinguish between different types of turnover. First, we distinguish between leavers and joiners which allows us to look at two potential reasons why turnover could be a good, rather than a bad thing: the ability to replace an underperforming team member and the ability to bring in new skills and fresh ideas. Second we exploit different temporal horizons, as described in the previous section. While replacing an underperforming individual should have a more immediate effect on fund performance, changing the team to rebalance its skills and bring fresh ideas should matter when PE firms prepare for the next fund.

III.1 "Fixing" performance

To see what happens to performance in the short-run, we estimate regressions of the following form:

$$Performance_{j,k} = \lambda_j + \delta \cdot Turnover \ (leavers)_{jk,(t,t+5)} + \beta \cdot X_{j,k} + \epsilon_{j,(k)} \qquad (1)$$

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 3 presents the estimates of regression (3). In Column 1, we show that in the cross-section of managers, higher turnover over the first five years of a fund is associated with higher performance: the coefficient δ is positive and significant at the 10% level. It is also economically significant: an increase of turnover due to departures by 1 percentage point, is related to 2% higher IRR. In Column 2, 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. The coefficient δ is statistically significant at the 5% level and is also economically significant. An increase of leavers' turnover by 1 percentage point is related to a 4.4% higher IRR. Alternatively, we may express economic significance using the Beta coefficients. In that case, a one standard deviation increase in turnover yields a 0.17 standard deviation increase in performance of the current fund. In Column 3, we look instead at the average performance of the current fund k, and the subsequent fund $k + 1$. The coefficient on turnover remains statistically significant but the magnitude is lower as we extend the horizon. Using the beta coefficients, a one standard deviation increase in turnover yields a 0.16 standard deviation increase in the average performance of the current and subsequent funds.

We 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. Since we take into account the growth of the team (and we control for manager fixed effects) we know that the effect of leavers or joiners is not driven by a change in the size of the team. 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 statistically significant in Column 3. 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).[8]

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 Column 3.

In Columns 4-6, we repeat the specifications in Columns 1-3, Table 3, 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.[9] The coefficient is positive and statistically significant for this alternative definition of turnover: an increase of joiners' and leavers' turnover by 1 percentage point is related to 2.6% higher IRR (Column 5). Alternatively, using the beta coefficients, a one standard deviation increase in turnover yields a 0.26 standard deviation increase in performance.[10]

III.2 Team adaptability when raising a new fund

We next modify our analysis to examine the role of turnover on performance when teams need to raise new funds. We define turnover over a five-year period prior to the start of fund

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[8]In unreported regressions, we control for past fund performance, using lagged IRR as our measure, to address concerns that persistence in performance within a PE manager can explain the results. Results remain robust.

[9]Looking at joiners and not only leavers is consistent with the approach in Davis and Haltiwanger (1992), who study the reallocation of team members across plants associated with simultaneous job creation and destruction in an establishment.

[10]In Table A1, we repeat specifications in Columns 2-3 and 5-6, Table 3, using multiples and DPI to measure fund performance.

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 effect on fund performance when they need to make new investment decisions. 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 4. In Columns 1-3, we examine turnover based on leavers, and in Columns 3-6 we examine turnover based on leavers and joiners. In Columns 1-2 and 4-5, performance is defined as the logarithm of net IRR of fund k and in Columns 3 and 6, performance is the average net IRR of the current fund k and the subsequent fund $k + 1$. In these regressions, we include the same controls as in Table 3 (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 (Columns 2, 3, 5, and 6) to control for manager specific characteristics.[11]

As predicted, we find no significant effect of leavers' turnover on subsequent performance both in the cross-section or the time-series. On the contrary, we find a positive and statistically significant effect of leavers' and joiners' turnover on next fund's performance in the cross-section (Column 4) and in the time-series (Columns 5-6). These results suggest that what matters when raising a new fund is not hiring individuals who can better restructure existing investments (as shown in Table 3), 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. The magnitude of the effect is higher when considering performance of the next fund only (Column 5) as compared to the average performance of the two subsequent funds (Column 6), with beta coefficients of 0.14 and 0.10 respectively, indicating that in

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[11]We also estimate these results defining team growth between $t - 5$ and $t - 1$ to parallel the turnover calculations. Results are robust. Moreover, results are similar when we control for past fund performance, using lagged IRR as our measure, to address concerns that persistence in performance within a PE manager can explain the results.

a changing economic environment constant replenishing of skills is required for subsequent funds to continue to be successful.

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. Our results are robust.

III.3   Decomposing turnover

To alternatively document the different effects 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 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 2-3, Table 3, using the decomposition of turnover outlined above. We present the results in Columns 1-2, Table 5. Across specifications, the coefficient of *Departures with replacement* is positive and statistically significant. Moreover, the magnitudes of the coefficients weaken when 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 3, and suggest that replacements of bad performers, likely captured by *Departures with replacement*, impact fund performance of the current fund.

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 2-3, Table 4, using instead the three components to characterize turnover. We report results in Columns 3-4, Table 5. 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 when raising the next fund as fresh ideas help firms respond to shifting external conditions.

IV   Further evidence concerning mechanisms

So far we have found no evidence of a negative correlation between turnover and performance, which seems inconsistent with the idea that team stability is desirable. Moreover,

our 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.

IV.1 The individual performance of leavers and joiners

In this Section, we look directly at the performance of the individuals who leave or join, exploiting the fact that we know what deals they were involved in and that we observe the final performance of those deals. In Table 6, we look at the gross IRR of each deal and introduce a dummy that takes value 1 if one person involved in the deal left before the deal was exited (Deal of leavers) and a dummy that takes value 1 if one person that was involved in the deal had joined the PE firm up to three years prior to the investment of the deal (Deals of joiners).[12]

Table 6 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 char-

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[12]Our sample includes all realized and written-off deals invested between 1986 and 2011, and excludes any unrealized investments in our data. Including the unrealized deals does not change the results. Standard errors are clustered at the fund manager level.

acteristics 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. Overall, this evidence suggests that the improvement in the fund performance that we observe following turnover is not something mechanical driven by some fund dynamic but is actually rooted in a better performance of the individuals at the deal level.

This implies 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. 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.

To further enhance this evidence, we also examine the reasons why people leave (available for a subset of leavers in our sample), collected during the due diligence process by our data provider. This allows us also to distinguish, at least to some extent, between forced and voluntary turnover. This information comes from talking to the manager, talking to the individuals who left, or from other sources the investor has access to during the due diligence process. Although not always informative, the reasons often provide specific explanations as to why people leave. In numerous cases, the manager will directly mention poor performance and lack of fit with the team as the key reason for departure. For example, they say: "*…it is the result of an up-or-out policy since he could not reach the next level in the organization*", "*Poor Performance- was responsible for …deals, which developed to a write-off*", "*had not the skillset for the evolution of the firm*", "*..did not fit in well with the rest of the team or the culture*", "*No fit with private equity*". On the contrary, in a few instances the reasons indicate the leaver was a good performer. They say, for example: "*…got an offer he couldn't refuse*", "*…he is a big loss to the firm*", "*this came as an unpleasant and unexpected surprise…was clearly the next one in line who would be promoted*".

As it is difficult to evaluate the truthfulness of the reasons provided, we instead use the next appointment of the individual (when available) to examine whether the observed departures are departures of bad or good leavers. We, thus, create four groups: i) individuals moving to another manager within the industry, ii) individuals moving out of Private Equity (including taking another job in finance), iii) individuals who retire, or state personal reasons for leaving (e.g. geographical preferences), or leave due to some exogenous event (e.g illness), iv) other reasons, including generic descriptions provided as reasons for leaving (e.g. pursue other opportunities). Our prediction is that better performers are more likely to stay in the PE industry compared to bad performers who should be more likely to exit. We have no clear prediction for individuals who left for other reasons, such as retiring, as there is no reason to believe these should be good or bad performers.

In Table 7, we examine the correlation between the average deal performance of the individual based on deal attribution data (also used in Table 6) and the four dummies representing each of the groups defined above. Thus, *PE* is a dummy (Column 1) which takes a value of 1 if the individual moves within the Private Equity industry after leaving and 0 otherwise; *OutPE* dummy (Column 2) takes a value of 1 if the individual moves outside the PE industry after leaving and 0 otherwise; *Retpersexog* dummy (Column 3) takes a value of 1 if retirement, leaving for personal reasons or an unforecastable circumstance takes place (e.g. illness) and 0 otherwise; *Other* dummy (Column 4) takes a value of 1 for other various reasons provided (e.g. leave to study) or if the reason provided is not particularly informative. Note our sample includes only individuals who left the PE firm and for which some information why they left is available. We include manager fixed effects in our regressions to control for the fact that managers may have different propensities to disclose specific information related to the where leavers transition to. As predicted, better performers, based on average IRR of deals they participate in, are more likely to move within the industry, while worse performers are more likely to transition to a job outside the industry. At the same time, when retirement, personal reasons (Column 3) or other reasons (Column 4) are stated, we are not able to capture any statistical significance. Thus, the statements made by the PE managers about the reasons for leaving seem truthful. Moreover, this indicates that the PE managers are well aware when the individual leaving is underperforming and thus this type of turnover is likely to be forced.

If the results above suggest that the positive effect of turnover may be driven by underperforming individuals, the mirror question is: when the highest quality people are the ones leaving, do we still find a positive effect? To study this, we focus on cases where high skill employees, or experienced employees with firm-specific human capital leave the firm.

Thus, in Table 8 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, 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 1-2 of Table 8. Consistent with our intuition, the interaction coefficient is negative and statistically significant, while the baseline effect of departures remains positive and statistically significant. Thus, the departure of high skill individuals is associated with a less positive future performance, which is consistent with the explanation that turnover allows the companies to improve the quality of its employees.

To proxy for high skilled individuals, we also use information about the job tenure of individuals at the time of leaving. Senior employees with a lot of experience and firm-specific knowledge are more likely to disrupt firm performance upon leaving. 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 8, we show a negative differential effect of turnover on performance when employees with firm-specific human capital leave the firm.[13]

IV.2   Team adaptability

Our results in Tables 5, 6 and Table 8 suggest that turnover may help teams to adapt and replenish their skills in response to shifting demand. Here, we provide further evidence in support of this channel. To do this, we want to identify situations where being able to adapt is particularly important. We hypothesize that in recessions there is an increasing need for PE teams to restructure companies they are invested in and so we examine whether a change in team composition during recessions is more effective than in other periods. Since

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[13]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).

this hypothesis is consistent with the idea that a change in skills is needed and that the effect is not to fix investments already made but to improve in the long-run (for example by changing the type of investments chosen), we focus on the turnover of leavers and joiners and repeat specifications in Columns 5-6 of Table 4. In Table 9, we show that indeed it is the turnover during recessions which is associated with better performance.[14] The average effect of recessions on performance is negative and statistically significant, suggesting that it is not the recession per se but the ability to adapt during recessions that brings improvement.

Moreover, we want to show that the best managers are indeed the ones who are more willing to adapt and change their team when it is most needed (i.e. during a recession). We create a time-varying variable for each manager which takes a value of 1 if average PE firms' funds prior performance is above the sample median, and 0 otherwise. In Table 10 we also introduce one more dimension, i.e. the type of skills an individual has to offer. In particular, we focus on individuals with an operational background. The underlying assumption is that operational skills are more valuable in recessions when operationally restructuring the invested companies is mostly required (and availability of leverage is limited). Thus, 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 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 the 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.

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 the PE team at a given year normalized by the size of the team, as our dependent variable.

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[14]We 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 over the period in which we compute the turnover.

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 Frictions

Our results suggest a positive relation between turnover and future performance, despite the common consensus. This implies PE managers have less turnover than what is optimal. The question thus is what forces are at play that lead to a suboptimal level of turnover. In other words, why would a PE company refrain from firing an underperforming individual, or from changing individuals to adapt to different circumstances? We consider three possible frictions: i) aymmetric information, ii) scarcity of resources, iii) legal restrictions to firing.

V.1 Asymmetric Information

Private equity investments are notoriously opaque and difficult to evaluate: one is certain of the performance of an investment only at the time of exit.[15] Therefore, it may be difficult for a PE manager to convey to the investors that the sudden departure of some partners is not an unwanted event, but a conscious choice by the PE manager to change part of the team.

To show how this lack of transparency can have an effect, we compare the performance of investment-deals with turnover relative to investment-deals with no turnover using deal attribution data as in Table 6.[16] Thus, we define a dummy ($Turnover_{it}$) that 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.

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[15]There are plenty of examples in private equity in which, although the company was performing well, the PE manager struggled to find a buyer to successfully exit the investment, so that the final performance was in the end less satisfactory than expected.

[16]Note the sample size in this analysis matches that in Table 6 once we control for the same fixed effects as not all variables are available for all deals.

Table 11 presents the results. We use gross IRR (winsorized at 1%) as our measure of performance. 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 turnover.

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. However, this relationship is explained by bad performers leaving, as shown earlier, rather than by departures hurting performance. But the difficulty in disentangling the two effects and to correct for the endogeneity may make an investor wary of turnover.

Such informational asymmetries should be more severe in cases where managers do not have an established reputation among investors. Managers who are less certain to secure fundraising will be more reluctant to adapt their teams to changing conditions. To proxy for manager reputation in our data, 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 average 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.[17]

In Table 12, 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 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. This evidence suggests that the best managers are more prone to change their teams, as asymmetry of information is lower for those managers.

Alternatively, we proxy for low asymmetry of information by looking at how many deals are exited. As mentioned earlier, it is very hard for an investor to know whether an

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[17]We 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 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.

investment is successful before it is exited. We, therefore, hypothesize that if a fund had several exits, the asymmetry of information is greatly reduced. Moreover, exits are often used as a measure of success (see for example Cornelli, Kominek and Ljungqvist (2014)); therefore if a fund has already had several exits it has proved to be successful. Note we exclude written-off deals, which obviously indicate negative performance. In Table 13, we show that there is higher turnover once a fund had several exits, namely when asymmetry of information is lower.

Finally, we proxy for managers' reputation using fund size. Fund size ($Size$) is measured as the dollar amount of capital a fund has under management (log transformed). Therefore, in Table 14, we add an interaction term between leavers' turnover (defined as in Table 3) and fund size – our proxy for more reputable managers. In these regressions, we also control for deals exited, defined as in Table 13, to make sure that our proxy for fund size is not picking up (mechanical) correlations between performance and deals exited, given larger funds should also have more deals exited. The interaction coefficient is negative and 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.

V.2 Legal restrictions to firing

We next examine the possibility that laws guiding hiring and firing of workers may lead to suboptimal turnover by PE firms. Although this explanation seems unlikely, given these employees are mostly partners and therefore less likely to be affected by such law restrictions, we conduct a simple analysis to test whether this channel is at work. We employ information on employment protection legislations which guide the ability of firms to fire workers and vary across countries and over time (Simintzi, Vig, and Volpin, 2015). In unreported regressions, we test whether there is a differential effect of turnover on performance depending on differences in employment protection laws the different funds

are subject to.[18] We observe no differential effects. We, thus, conclude that frictions in labor markets due to regulation cannot explain our findings.

V.3 Scarce supply of high skilled individuals

PE partners are overall highly skilled individuals, and thereby in short supply. This may also be a friction that will induce a PE manager to reduce turnover.[19] For example, in Table 12, we saw that the individuals leaving tend to be those underperforming with respect to the average of the company. But this does not imply that a fund can always substitute its worse performers with better people, if the potential hires are of lower quality. Similarly, the ability to adapt and to bring fresh ideas is valuable only if the fund can bring (highly) skilled individuals from the labor market.

Some of the evidence presented earlier is consistent with this hypothesis. For example, in Table 12, we showed that better performing managers are firing a higher fraction of bad performers. If better performing managers are able to attract the best individuals (because of higher reputation or because of the expectation of higher carry), then the implication is that these managers face less constraints in replacing the individuals leaving with higher quality individuals.

VI Conclusion

Contrary to the common view that stable teams outperform, we find a positive association between team turnover and future performance, in the context of private equity. Private Equity is an ideal setting to study this question given the importance of human capital in the industry. The simple organizational structure of the PE firms allows for meaningful comparisons across teams.

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[18]Sometimes funds have offices in different countries. Since we know in which office an individual is officially employed, we use the law of that country.

[19]To be precise, one could argue this is not exactly a friction, but a feature of the environment within which a PE manager will optimize. However, to simplify the exposition, we will refer to it as a friction.

We show that turnover can help eliminate worse performing individuals and update PE teams adapting 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 asymmetry: given the opacity of private equity investments, investors may doubt the overall credibility of the manager to generate returns if they see change in the team they picked. Another may be the inability to find high skill individuals.

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).

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Figure 1: Number of Private Equity professionals hired/departed

This figure shows the number of Private Equity professionals hired (positive values) and departed (nagative 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.
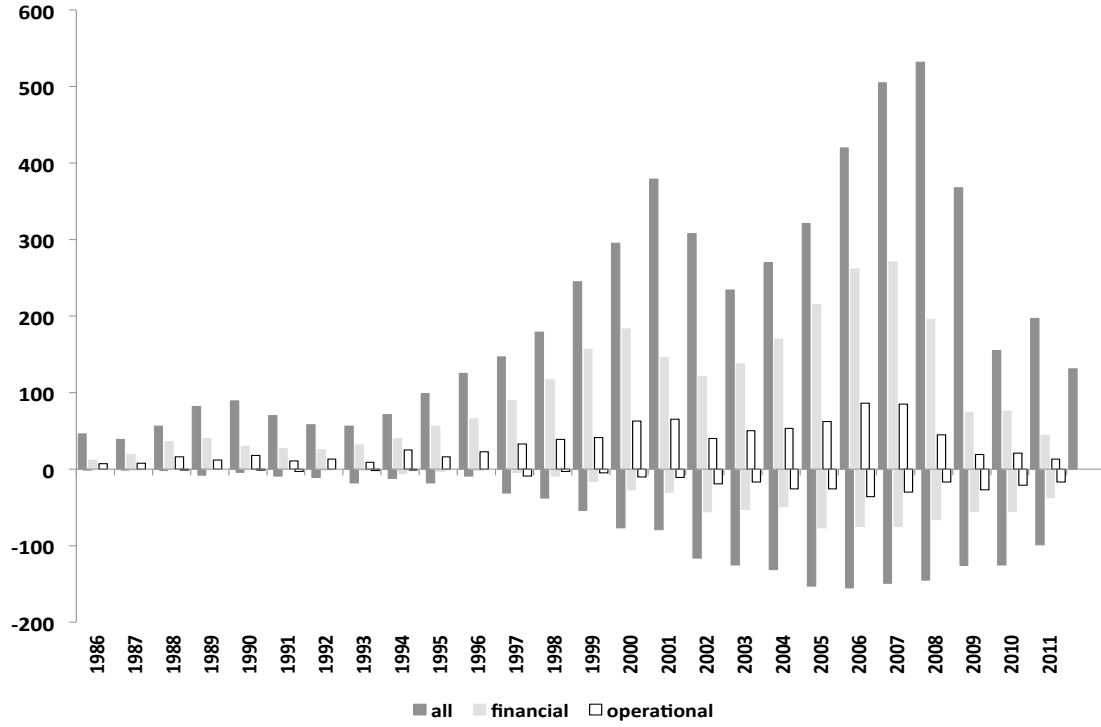
Figure 2: Number of Total and Written-off Deals

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.
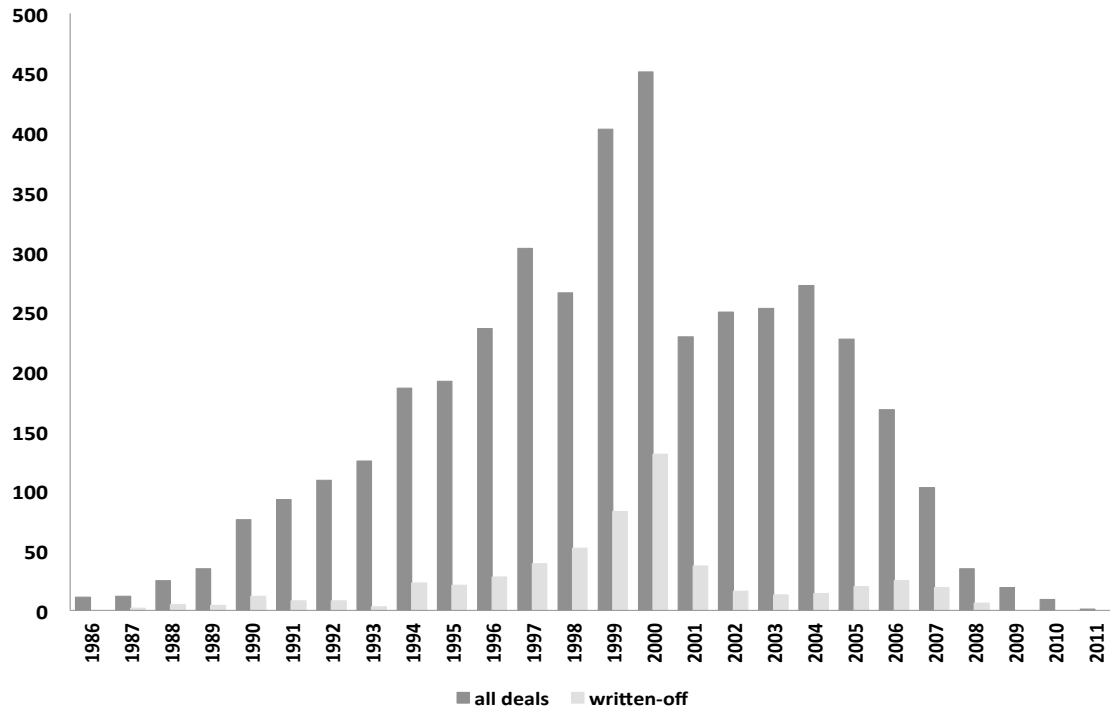
Figure 3: Percentage of Deals Across Countries

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.
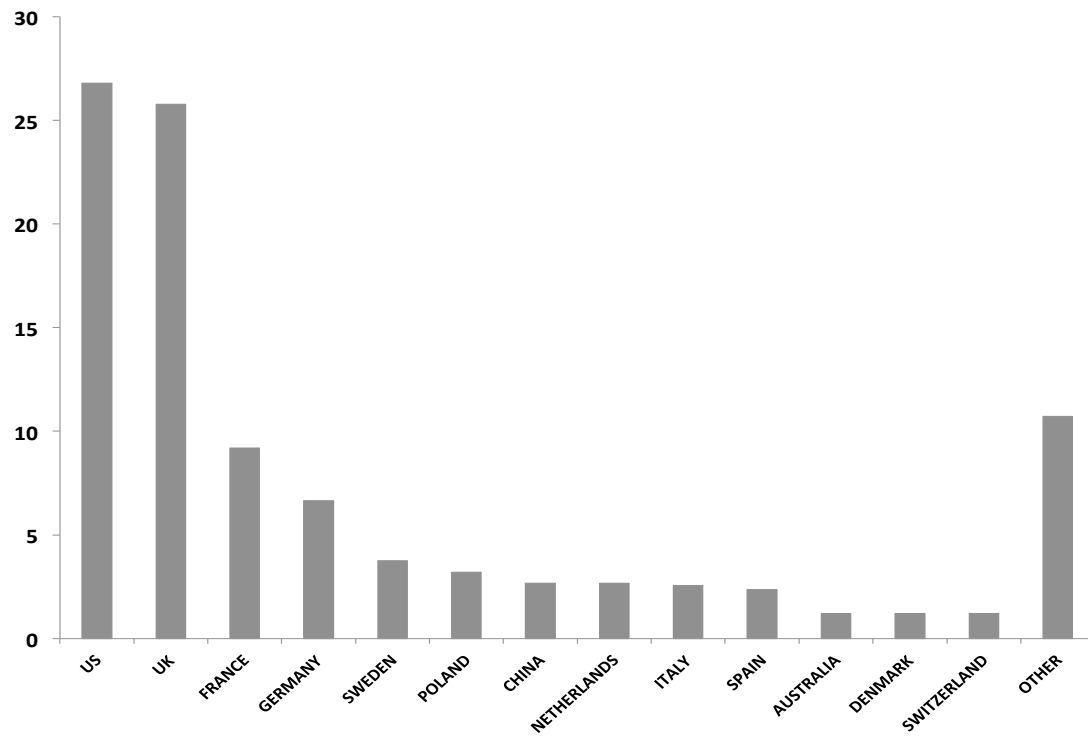
Figure 4: Temporal Structure of PE Funds

This figure presents the temporal structure of PE funds. Fund K starts in year T and closes, on average, after 10 years. The first 5 years of the fund $(T, T + 5)$ is typically considered to be the investment period when investments are made. Fund raising and preparation for the next fund typically starts 5 years earlier between $T - 5$ and T. Funds tend to overlap with each other and tend to be, on average, 5 years apart.
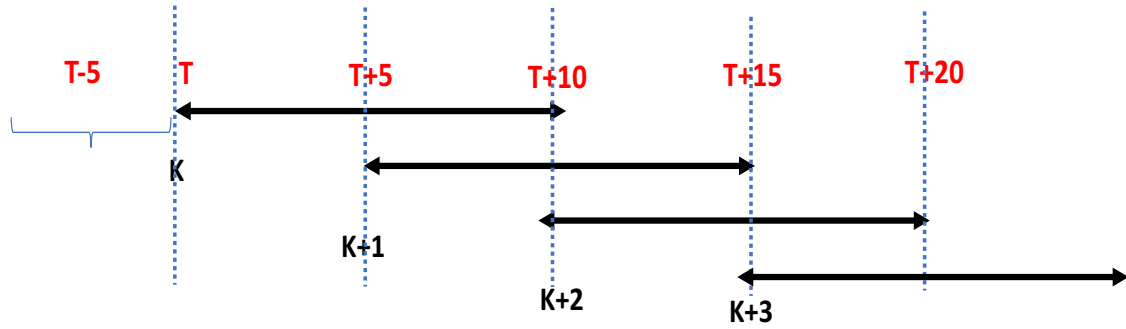
Table 1: Summary statistics

This table reports summary statistics for individual characteristics (Panel A), for team characteristics at the deal level (Panel B), and for team characteristics at the PE level (Panel C). In Panel A, MBA is a dummy that takes a value of 1 if the professional holds an MBA degree and $Top10MBA$ degree takes a value of 1 if the professional holds an MBA degree from a Top 10 program, according to FT MBA rankings. $Operational$ ($Financial$) 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. $Tenure$ refers to the number of years the individual has been with the firm. 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.

|	% of Individuals	Average	St. Dev	25th percentile	50th percentile	75th percentile
Panel A: Individual Characteristics						
MBA	28.7	0.28	0.45	0	0	1
Top 10 MBA	23.4	0.23	0.42	0	0	0
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
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 C: 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 chatacteristics (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: "Fixing" 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 1-2, 4-5, and the average performance of the current fund k and the subsequent fund $(k + 1)$ in Columns 3 and 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)
	k	k	k, k+1	k	k	k, k+1
Turnover (leavers)$_{jk,(t,t+5)}$	0.0181	0.0441	0.0210			
	(0.0098)*	(0.0215)**	(0.0100)**			
Turnover (leavers+joiners)$_{jk,(t,t+5)}$				0.0174	0.0258	0.0127
				(0.0048)***	(0.0102)***	(0.0054)**
Team Growth	0.178	0.0191	-0.044	0.0716	-0.052	-0.079
	(0.081)**	(0.093)	(0.046)	(0.0562)	(0.080)	(0.049)
Team Size	-0.010	-0.174	-0.473	-0.053	-0.107	-0.444
	(0.371)	(0.609)	(0.335)	(0.374)	(0.613)	(0.338)
Team Size Squared	-0.0001	-0.0280	0.024	0.009	-0.011	0.033
	(0.058)	(0.092)	(0.048)	(0.058)	(0.095)	(0.048)
Size	-0.054	-0.088	-0.065	-0.050	-0.071	-0.056
	(0.035)	(0.056)	(0.023)***	(0.035)	(0.051)	(0.021)***
Fund Manager FE		Yes	Yes		Yes	Yes
R^2	0.05	0.35	0.59	0.06	0.36	0.60
Obs.	453	453	453	453	453	453

Table 4: Team adaptability when raising a new fund

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 1-2, 4-5, and the average performance of the current fund k and the subsequent fund $(k+1)$ in Columns 3 and 6. *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 3. 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)
	k	k	k, k+1	k	k	k, k+1
Turnover (leavers)$_{jk,(t-5,t-1)}$	-0.0210	-0.0368	-0.0139			
	(0.0158)	(0.0258)	(0.0114)			
Turnover (leavers+joiners)$_{jk,(t-5,t-1)}$				0.0051	0.0091	0.0056
				(0.0019)***	(0.0038)**	(0.0025)**
Team Growth	0.158	-0.0128	-0.0659	0.160	-0.0173	-0.0665
	(0.075)**	(0.0785)	(0.0424)	(0.079)**	(0.0798)	(0.0411)
Team Size	0.053	-0.266	-0.540	0.076	-0.0329	-0.426
	(0.435)	(0.756)	(0.454)	(0.414)	(0.664)	(0.420)
Team Size Squared	-0.0069	-0.011	0.033	-0.012	-0.054	0.014
	(0.069)	(0.115)	(0.066)	(0.065)	(0.098)	(0.060)
Size	-0.057	-0.0693	-0.0569	-0.058	-0.0768	-0.0596
	(0.034)*	(0.0530)	(0.0220)**	(0.035)	(0.0547)	(0.0233)**
Fund Manager FE		Yes	Yes		Yes	Yes
R^2	0.04	0.35	0.59	0.04	0.35	0.59
Obs.	431	431	431	431	431	431

Table 5: 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 and 3, the average performance of the current fund k and the subsequent fund $(k+1)$ in Columns 2 and 4. *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 1-2 and between $t-5$ and $t-1$ in Columns 3-4) 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 1-2 and between $t-5$ and $t-1$ in Columns 3-4) 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 1-2 and between $t-5$ and $t-1$ in Columns 3-4) 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 3. 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)
	k	k, k+1	k	k, k+1
Departures with replacement$_{jk,(t,t+5)}$	0.255	0.138		
	(0.144)*	(0.0715)*		
Departures with no replacement$_{jk,(t,t+5)}$	0.322	0.157		
	(0.193)*	(0.102)		
Additions to team$_{jk,(t,t+5)}$	-0.0325	-0.0752		
	(0.149)	(0.0718)		
Departures with replacement$_{jk,(t-5,t-1)}$			-0.050	-0.014
			(0.112)	(0.067)
Departures with no replacement$_{jk,(t-5,t-1)}$			-0.088	-0.007
			(0.150)	(0.074)
Additions to team$_{jk,(t-5,t-1)}$			0.285	0.174
			(0.161)*	(0.077)**
Team Size	-0.062	-0.370	-0.307	-0.441
	(0.578)	(0.300)	(0.642)	(0.374)
Team Size Squared	-0.0410	0.0148	0.0224	0.0444
	(0.0944)	(0.0481)	(0.106)	(0.0576)
Size	-0.083	-0.0618	-0.0626	-0.0495
	(0.0560)	(0.0230)***	(0.0505)	(0.0211)**
Fund Manager FE	Yes	Yes	Yes	Yes
R^2	0.36	0.60	0.36	0.60
Obs.	453	453	431	431

Table 6: 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)
Deals of joiners	0.0934		0.0950	0.108		0.112
	(0.0543)*		(0.0552)*	(0.0574)*		(0.0600)*
Deals of leavers		-0.117	-0.118		-0.147	-0.150
		(0.0537)**	(0.0535)**		(0.0644)**	(0.0642)**
Size	0.0271	0.0424	0.0348	0.0316	0.0508	0.0426
	(0.0154)*	(0.0166)**	(0.0156)**	(0.0144)**	(0.0165)***	(0.0157)***
Age	-0.0029	-0.0018	-0.0024	-0.0037	-0.0024	-0.0033
	(0.0046)	(0.0045)	(0.0044)	(0.0045)	(0.0044)	(0.0044)
Experience	0.0135	0.0065	0.0151	0.0108	0.0032	0.0131
	(0.0091)	(0.0064)	(0.0089)*	(0.0087)	(0.0068)	(0.0087)
Busy	0.0703	0.0707	0.0687	0.0502	0.0519	0.0493
	(0.0217)***	(0.0221)***	(0.0222)***	(0.0220)**	(0.0223)**	(0.0225)**
Keymen	0.197	0.179	0.179	0.190	0.167	0.168
	(0.0762)**	(0.0697)**	(0.0706)**	(0.0817)**	(0.0753)**	(0.0757)**
Carry	0.0605	0.0419	0.0393	0.0933	0.0702	0.0672
	(0.0960)	(0.0993)	(0.0986)	(0.100)	(0.101)	(0.100)
Operational	-0.0748	-0.0717	-0.0677	-0.0822	-0.0801	-0.0736
	(0.0950)	(0.0954)	(0.0950)	(0.116)	(0.116)	(0.116)
Financial	-0.0142	-0.0164	-0.0106	-0.0546	-0.0552	-0.0525
	(0.0806)	(0.0807)	(0.0816)	(0.0975)	(0.0972)	(0.0976)
MBA	0.100	0.0939	0.0978	0.0753	0.0624	0.0673
	(0.0744)	(0.0755)	(0.0758)	(0.0783)	(0.0799)	(0.0796)
Ownership	-0.0222	-0.0181	-0.0203	-0.0366	-0.0322	-0.0348
	(0.0284)	(0.0284)	(0.0283)	(0.0295)	(0.0293)	(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 7: Where individuals transition to after leaving the PE firm

This table examines where individuals are going to after leaving the PE firm. It reports regressions of the average individual deal performance based on individuals' deal attribution data (also used in Table 6) on four dummies defined as follows: in Column 1, *PE* takes a value of 1 if the individual moves within the Private Equity industry after leaving and 0 otherwise; in Column 2, *OutPE* takes a value of 1 if the individual moves outside the PE industry after leaving and 0 otherwise; in Column 3, *Retpersexog* takes a value of 1 if retirement, leaving for personal reasons or an unforecastable circumstance takes place and 0 otherwise; in Column 4, *Other* takes a value of 1 for other various reasons provided or if the reason provided is not particularly informative. The sample includes individuals who have left the PE and for which some information on the reasons why the left is available. 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.

	PE	**OutPE**	**Retpersexog**	**Other**
	(1)	(2)	(3)	(4)
Past individual performance	0.0736	-0.0831	0.0353	0.0195
	(0.0401)*	(0.0334)**	(0.0413)	(0.0479)
Fund Manager FE	Yes	Yes	Yes	Yes
R^2	0.27	0.24	0.22	0.40
Obs.	653	653	653	653

Table 8: 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 3). $Turnover\ (leavers)_{jk,(t,t+5)}$ 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 3. 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)
	k	k, k+1	k	k, k+1
$Turnover\ (leavers)_{jk,(t,t+5)}$	0.0546	0.0285	0.0590	0.0316
	(0.0233)**	(0.0112)**	(0.0276)**	(0.0146)**
$Turnover\ (leavers)_{jk,(t,t+5)}*Turnover\ (leavers)\ Skilled_{jk,(t,\ t+5)}$	-0.0154	-0.0111		
	(0.0091)*	(0.0044)***		
$Turnover\ (leavers)_{jk,(t,t+5)}*Turnover\ (leavers)\ Senior_{jk,(t,\ t+5)}$			-0.364	-0.258
			(0.307)	(0.153)*
Team Growth	0.0132	-0.0483	0.0145	-0.0478
	(0.0883)	(0.0462)	(0.0883)	(0.0466)
Team Size	-0.267	-0.531	-0.289	-0.558
	(0.608)	(0.340)	(0.619)	(0.354)
Team Size Squared	-0.0135	0.0326	-0.0108	0.0363
	(0.0929)	(0.0486)	(0.0957)	(0.0515)
Size	-0.0767	-0.0565	-0.0803	-0.0592
	(0.0546)	(0.0222)**	(0.0555)	(0.0233)**
Fund Manager FE	Yes	Yes	Yes	Yes
R^2	0.36	0.60	0.35	0.59
Obs.	453	453	453	453

Table 9: Team adaptability: Turnover, recessions, and fund performance

This table examines the effect of PE team turnover on fund performance during recessions. Fund performance is the logarithm of IRR (defined as in Columns 5-6, Table 4). $Turnover\ (leavers+joiners)_{jk,(t-5,t-1)}$ 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. Recession is a dummy which takes a value of 1 if there is a recession in a given region over the same period we compute the turnover. We consider a region to be in recession if GDP growth rate is negative for three consecutive quarters in the region. Note information about the region of a given fund is not always available. The rest of the variables are defined as in Table 3. 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)
	k	k, k+1
$Turnover\ (leavers+joiners)_{jk,(t-5,t-1)}$	-0.00005	0.00108
	(0.00462)	(0.00257)
$Turnover\ (leavers+joiners)_{jk,(t-5,t-1)}*Recession$	0.0124	0.0064
	(0.0063)**	(0.0036)*
$Recession$	-0.324	-0.235
	(0.177)*	(0.0945)**
$Team\ Growth$	0.022	-0.0802
	(0.132)	(0.067)
$Team\ Size$	-0.530	-0.571
	(0.596)	(0.366)
$Team\ Size\ Squared$	0.0204	0.0390
	(0.0928)	(0.0508)
$Size$	-0.0507	-0.0570
	(0.0517)	(0.0238)
Fund Manager FE	Yes	Yes
R^2	0.32	0.58
Obs.	399	423

Table 10: Team adaptability: Top managers, recessions and team composition

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. Note information about the region is not always available. *Top Managers* is a time-varying variable, which takes a value of 1 if average 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)
Top Managers	-0.0252	-0.0229	-0.0046	-0.0043
	(0.0112)**	(0.0107)**	(0.0042)	(0.0044)
Top Managers $\times$ *Recession*$_{t-1}$	0.0152	0.0156	0.0098	0.0098
	(0.0071)**	(0.0071)**	(0.0054)*	(0.0054)*
Recession$_{t-1}$	-0.0192	-0.0195	-0.0024	-0.0024
	(0.0112)*	(0.0113)*	(0.0060)	(0.0060)
Size		-0.0119		-0.0013
		(0.0143)		(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: 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)
$Turnover_{it}$	-0.233	-0.219	-0.0975	-0.0746
	(0.0432)***	(0.0407)***	(0.0376)**	(0.0513)
$Size$				0.0398
				(0.0179)**
Age				-0.0021
				(0.0045)
$Experience$				0.0046
				(0.0064)
$Busy$				0.0727
				(0.0216)***
$Keymen$				0.197
				(0.0752)**
$Carry$				0.0402
				(0.0996)
$Operational$				-0.0791
				(0.0953)
$Financial$				-0.0234
				(0.0796)
MBA				0.0944
				(0.0742)
$Ownership$				-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 12: Managers' reputation and 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 average 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)
Top Managers	0.9022	0.9015	-0.0097	-0.0140	0.0677	0.0581
	(0.4617)**	(0.4884)*	(0.0968)	(0.106)	(0.0284)**	(0.0291)**
Size		0.0026		0.0191		0.0430
		(0.4520)		(0.105)		(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 13: Higher turnover when asymmetry of information is lower

This table examines whether turnover depends on deals exited in a given fund. $Turnover_{jk,(t,t+5)}$ is the average number of team members who leave (Column 1) and who join and leave (Column 2) 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. $Log(deal\ exits)_{jk,(t,t+5)}$ is the number of deals exited over a five-year period (between t and $t+5$) following vintage year t of fund k, except written-off deals (log-transformed). The rest of the variables are defined as in Table 3. 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.

	$Turnover_{jk,(t,t+5)}$	
	leavers	leavers+joiners
	(1)	(2)
$Log(deal\ exits)_{jk,(t,t+5)}$	0.899	2.495
	(0.180)***	(0.430)***
Team Growth	-0.941	1.114
	(0.578)	(2.343)
Team Size	0.638	-2.042
	(4.670)	(9.317)
Team Size Squared	-0.159	-0.773
	(0.817)	(1.765)
Size	-0.0209	-0.814
	(0.230)	(0.391)
Fund Manager FE	Yes	Yes
R^2	0.61	0.71
Obs.	453	453

Table 14: Turnover and fund size

This table examines the effect of PE team turnover on fund performance depending on fund size. Fund performance is measured as in Columns 1-3, Table 3. $Turnover\ (leavers)_{jk,(t,t+5)}$ 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. $Log(deal\ exits)_{jk,(t,t+5)}$ is defined as in Table 13. The rest of the variables are defined as in Table 3. 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)
	k	k	k, k+1
$Turnover_{jk,(t,t+5)}$	0.0980	0.176	0.0969
	(0.0447)**	(0.0895)*	(0.0501)*
$Turnover_{jk,(t,t+5)}*Size$	-0.0133	-0.0220	-0.0116
	(0.0059)**	(0.0113)*	(0.0061)*
$Team\ Growth$	0.162	-0.051	-0.067
	(0.0612)***	(0.0740)	(0.0457)
$Team\ Size$	-0.102	-0.619	-0.573
	(0.380)	(0.536)	(0.325)*
$Team\ Size\ Squared$	0.0201	0.0471	0.0433
	(0.0601)	(0.0853)	(0.0462)
$Size$	-0.0322	-0.0419	-0.0382
	(0.0388)	(0.0674)	(0.0281)
$Log(deal\ exits)_{jk,(t,t+5)}$	0.235	0.301	0.113
	(0.0398)***	(0.0609)***	(0.0299)***
Fund Manager FE		Yes	Yes
R^2	0.10	0.38	0.61
Obs.	453	453	453

Table A1: 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 Columns 1-4 and DPI in Columns 5-8, and is the performance of fund k in Columns 1, 3, 5, and 7, the average performance of the current fund k and the subsequent fund $(k+1)$ in Columns 2, 4, 6, and 8. *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 3. 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.

	Multiple				DPI			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Turnover (leavers)$_{jk,(t,t+5)}$	0.0456	0.0350			8.252	6.284		
	(0.0141)***	(0.0102)***			(1.881)***	(1.660)***		
Turnover (leavers+joiners)$_{jk,(t,t+5)}$			0.0233	0.0159			4.545	3.371
			(0.0070)***	(0.0051)***			(0.976)***	(0.843)***
Team Growth	-0.078	-0.173	-17.69	-25.67	-0.154	-0231	-32.02	-36.77
	(0.105)	(0.105)	(13.98)	(12.04)**	(0.097)	(0.119)*	(12.56)**	(14.17)**
Team Size	-0.781	-1.191	-142.7	-144.8	-0.731	-1.157	-133.5	-138.1
	(0.574)	(0.576)**	(71.72)**	(69.16)**	(0.573)	(0.588)*	(70.39)*	(70.28)*
Team Size Squared	0.005	0.058	-0.456	-0.348	0.020	0.067	2.668	1.882
	(0.081)	(0.074)	(10.41)	(9.68)	(0.084)	(0.075)	(11.02)	(9.84)
Size	-0.084	-0.077	-15.86	-13.13	-0.068	-0.066	-12.76	-10.86
	(0.028)***	(0.025)***	(4.25)***	(3.74)***	(0.029)**	(0.023)***	(3.935)***	(2.891)***
Fund Manager FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.46	0.66	0.62	0.73	0.47	0.66	0.75	0.79
Obs.	511	511	511	511	511	511	511	511