

# **What Does it Mean to be in a Team?**

## **Evidence from U.S. Mutual Fund Managers**

**Diamond Wang<sup>1</sup>**

[diamond.wang@auckland.ac.nz](mailto:diamond.wang@auckland.ac.nz)  
Department of Accounting and Finance  
The University of Auckland

### **Abstract**

In recent years, team management has replaced single management to become the dominant management structure in the U.S. mutual fund industry. However, empirical studies on the impacts of team management show mixed results. Using accurate fund manager information from actively-managed equity mutual funds, this paper re-examines the effect of team management on fund outcomes after controlling for fund and managerial characteristics, as well as unobservable managerial heterogeneities that have shown to play an important role in determining fund performance. I find no evidence that fund performance differs between team- and single-managed funds. However, when a manager joins a large team, the manager on average receives less fund flow compared to when this manager manages a fund individually. The sensitivity of fund flow to fund performance for a manager is also lower when in a team compared to being single.

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# 1 Introduction

In the last few decades, the mutual fund industry in the United States has grown enormously. During this period, team management, one aspect of the mutual fund organisational structure, also showed a remarkable increase in popularity. For example, in 1992 only 30% of U.S. domestic actively-managed equity mutual funds were managed by more than one fund portfolio manager; whereas in 2015, around 70% of these funds were managed by teams of managers (See Figure 1). Consistent with this trend, several large mutual fund families started to offer team-managed funds and emphasized team management in their marketing strategies<sup>2</sup>. Industry observers explain this trend from a performance perspective saying that sharing management responsibility among a group of individuals allows funds to be more efficiently managed in an unprecedentedly complex environment<sup>3</sup>.

However, in contrast to the favourable view from industry, empirical studies examining the relationship between management structure and fund performance provide mixed findings regarding the benefits of team management. Some studies show a positive correlation between team management and fund performance (e.g., Han, Noe, and Rebello, 2012; Patel and Sarkissian, 2014) while others find that fund performance does not differ significantly between team- and single-managed funds (e.g., Prather and Middleton 2002, 2006; Bliss, Potter, and Schawarz, 2008), and yet others find that team managed funds underperform (e.g., Chen, Hong, Huang, and Kubik, 2004; Bär, Kempf,

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<sup>2</sup> “Fidelity says to offer team-managed funds” from Reuters  
<http://www.reuters.com/article/fidelity-mutualfunds-idUSN2522199020071025>

<sup>3</sup> “Funds move away from star managers, favor teams” by Jessica Toonkel  
<http://www.reuters.com/article/us-funds-stars-idUSTRE7B11TI20111202>; “Funds now using team approach” by Lisa Singhania from Ocala Star-Banner  
<https://news.google.com/newspapers?nid=1356&dat=20020610&id=YfFPAAAIBAJ&sjid=wQgEAAAIBAJ&pg=4873,5317282&hl=en>; “BANDING TOGETHER: More mutual fund companies take a team approach” by Dave Kovalski from Pensions and Investments  
[http://www.pionline.com/article/20000724/PRINT/7240741?templa=.](http://www.pionline.com/article/20000724/PRINT/7240741?templa=)

& Ruenzi, 2010). Given these mixed findings, it is unclear whether team management offers a superior management structure to the mutual fund industry and ultimately to the investors.

In a related literature, several studies document the influence of managerial characteristics on mutual fund performance. These studies show that both observable (e.g., Chevalier and Ellison, 1999) and unobservable (e.g., Huang and Wang, 2015) managerial attributes play important roles in determining fund outcomes. Given this evidence, it is clear that to assess the impact of team management on fund performance, observable and unobservable managerial heterogeneities should be taken into account. The ambiguity in past empirical evidence on the impact of team management might be explained by a lack of accurate control for manager-specific attributes. Just as individual managers are unique, teams are not the same as they are comprised of different individuals. Previous studies on the effect of team management compare team- and single-managed funds directly without taking into account the fact that the managers involved in these funds might be different. In this paper, I control for fund and managerial characteristics as well as fund and manager fixed effects to take into account observable and unobservable differences between the funds and the fund managers. While previous empirical findings address the question of whether team-managed funds outperform single-managed funds, the question addressed in this study is whether a manager, on average, performs differently when (s)he is part of a team compared to when the manager is managing the fund individually.

It is also necessary to control for manager heterogeneity because of potential selection bias, i.e. managers with different levels of ability may be non-randomly selected into team- or single-management (Han et al., 2012). The use of manager fixed effects controls for unobservable managerial abilities to ensure that the possible impact

of team-management is not concealed by any ability differences between managers who prefer to work in funds with certain management structures.

I obtain fund data and managerial information from Morningstar Direct, a data source that provides accurate managerial information as shown in previous studies (Ding and Wermers, 2012; Massa, Reuter, and Zitzewitz, 2010; Patel and Sarkissian, 2014). Using Morningstar data, I can track manager movements between funds throughout the sample, which ensures that fund management structure can be correctly identified, and that fund and managerial heterogeneities can be accurately taken into account. I focus on actively managed U.S. domestic open-end equity mutual funds. The data covers a sample of 3,602 funds and 6,518 fund managers in time period from 1992 to 2015. I first investigate the effect of team-management on fund performance, and then examine fund flow to test for any differences in fund flow sensitivity to performance between team- and single-managed funds.

My findings are as follows. First, I find that, after controlling for manager and fund heterogeneities, risk-adjusted fund performance and fund return volatility do not differ significantly between funds that are managed by teams of managers (team-managers) and funds that are managed by individuals (single-managers). As fund and manager-specific attributes are controlled for in the analyses through the use of fund and manager fixed effects, these findings indicate that the same manager does not generate a different level of performance by joining a team compared to a situation where the manager is managing the fund by himself/herself. The effect of team management on fund performance does not vary with team size, as having more managers in a team has no significant impacts on fund return and return volatility.

Second, I find no evidence that by changing to a team-managed fund structure, mutual funds attract additional cash flow from investors. There is no significant difference between the levels of fund flow allocated to team- and single-managed funds on average. However, despite the lack of relationship between team size and fund performance, funds that employ large teams are being penalised as fund flows are significantly lower for funds managed by teams consisting of more managers. From a manager's perspective, a manager who works with many other managers in a team receives less fund flow compared to when this manager is the single-manager of this fund. Compared to single-managed funds (single-managers), investors are also less likely to make additional investments in funds following superior performance achieved by team-managed funds (team-managers). These findings might suggest that managers are less likely to attract investors' attention when they are managing funds in teams (see Massa et al., 2010).

This study has two contributions to the literature on mutual funds. First, it extends prior research on the relation between fund team management and fund outcomes. Current empirical studies provide puzzling results on the influence of team management. In addition to differences in samples, one possible explanation is that previous studies do not control for unobservable managerial heterogeneities that have been shown to have influence on fund outcomes. In this study, I assess the impact of team management free from interference of unobservable heterogeneities of the funds and the fund managers by controlling for fund and manager fixed effects. In other words, the results of this study show the impact of the same manager being in a team or a single-manager for the same fund.

Second, I investigate the effect of team management structure on mutual fund flow. By controlling for fund and manager fixed effects, the results of this study show the

impact of team management on fund flow that is not due to the influence of funds and the managers of the funds. To illustrate the importance of this research design, I find that without controlling for managers fixed effects, there is no evidence on the relation between team size and fund flow; whereas after controlling for manager fixed effects, I find that managers who join larger teams are associated with a lower fund flow. I also test for possible differences in the performance-flow relationship between funds that employ team- and single-management after controlling for fund and manager-specific effects.

The remainder of this paper is organised as follows. Section 2 reviews the literature on fund team management and provides the motivation for the study. Section 3 describes the data and variables used in the study. Section 4 presents the methodology used to test the influence of team-management on fund performance and fund flow. Section 5 reports the empirical findings. Section 6 concludes.

## **2 Literature Review and Motivation**

### **2.1 Fund Management Structure and Performance**

Golec (1996) is the first to examine the effect of management team size on mutual fund performance using a sample of 530 funds. His findings do not suggest that the number of managers involved in a fund has an impact on fund performance. Following Golec (1996), Prather and Middleton (2002, 2006) examine the performance differences between team- and single-managed funds from the perspective of classical and behavioural decision-making theories. Based on the assumption that all decision-makers are rational, classical decision-making theory predicts that the optimal performance outcome will be achieved irrespective of the form of management structure. On the other hand, behavioural decision-making theory suggests that team

management reduces biases and enhances consistency by pooling information and resources. Thus, teams are expected to make superior decisions as compared to decisions made by single managers. The empirical findings from Prather and Middleton (2002, 2006) show no benchmark-adjusted performance differences between team- and single-managed funds, which supports the classical decision-making theory. Similarly, Bliss et al. (2008) find that the risk-adjusted performance of team-managed funds is similar to funds managed by single managers, although team-managed funds display significantly lower cross-sectional variability in performance and lower risk factor loadings than single-managed funds. Using various risk-adjusted performance measures, Karagiannidis (2010) also reports similar performance between team- and single-managed funds. These findings show that the lack of influence of team management is not driven by differences in performance measurements.

In contrast, Chen et al. (2004) find that after controlling for fund size, team-managed funds underperform their single-managed counterparts by 48 basis points per year on average. Chen et al. (2004) argue that this underperformance may be attributable to higher hierarchy costs faced by team-managed funds as it may be more difficult for managers' decisions to be implemented. These findings support Stein's (2002) theory of organisational diseconomies. Bär et al. (2010) investigate the impact of management structure on fund performance and risk-taking behaviour in the context of the 'group shift' hypothesis versus the 'diversification of opinions' hypothesis. The group shift theory suggests that the opinion of team members shifts towards the opinion of the most dominant individual in a team. Consequently, teams are more likely to make extreme decisions than individuals. In contrast, the diversification of opinions hypothesis suggests that the team opinion is the average opinion from the team, and as a result teams are less likely to make extreme decisions on average. Overall, the

findings from Bär et al. (2010) support the diversification of opinions theory, as team-managed funds are found to follow less extreme and more diversified investment styles, and they are less likely to achieve extreme performance.

More recent studies seek to find possible explanations for the inferior performance associated with team management despite the sharp increase of team-managed funds. Han et al. (2012) argue that managers with superior investment skills would prefer to manage funds independently as they can benefit from undiluted claims of performance. In this setting, it is possible that single management is the inferior management structure to team management, but that the resultant observed underperformance is masked by selection bias, i.e. managers with different levels of ability may be non-randomly selected into team- or single-managed funds. Using the percent of team-managed funds in a fund family as an instrumental variable to capture variation in team management, Han et al. (2012) find team-managed funds outperform single-managed funds by 23 to 38 basis points per year. However, Adams, Nishikawa and Rao (2015) show that there are no significant performance differences between team- and single-managed funds even after controlling for potential self-selection bias. They find that team-managed funds only provide superior performance compared to single-managed funds under strong fund governance structure, which is represented by boards with more independent directors and smaller board size. In a recent study that uses data obtained from Morningstar Direct, Patel and Sarkissian (2014) also find that team-managed funds outperform single-managed funds. They highlight discrepancies between managerial information used in past studies and fund filings, and argue that previously documented team-managed funds underperformance was due to inaccurate managerial information.



## 2.2 **Manager Characteristics and Heterogeneities**

As investment outcomes are the results of investment decisions made by fund managers, managers should be considered as the major driver of mutual fund performance. As a result, recent studies have examined the relationship between fund managerial characteristics and fund performance. Several studies examine the influence of manager-specific attributes on mutual fund outcomes. For example, Golec (1996) shows that younger fund managers with MBA degrees and longer tenure provide a superior risk-adjusted return. Chevalier and Ellison (1999) also report that younger managers marginally outperform older managers. The papers by Bliss and Potter (2002) and Bontis, Bart, Switzer and Huang (2007) do not provide evidence for the impact of gender on fund performance but show that female managers are more likely to hold portfolios with marginally more risk than male managers. Several studies also highlight the importance of the quality of manager education. Chevalier and Ellison (1999) and Gottesman and Morey (2006) show that managers who have attended universities with higher average SAT or GMAT scores and top-ranked MBA programs provide superior performance. Overall, these studies show that fund manager characteristics are relevant to explain cross-sectional variation in fund performance.

Although these studies illustrate the influence of manager characteristics on fund performance, they only document the effect of observable managerial attributes. Several other studies investigate the effect of unobservable individual heterogeneities on fund performance, such as personal networks, risk preferences, and innate ability. These studies control for individual manager fixed effects and typically find that manager-specific effects explain a significant portion of the variation in fund performance and other outcomes. For example, Kacperczyk and Seru (2007) examine trades in response to public information signals by fund managers and find that

individual manager unobservable attributes have a significant role in explaining managers' reliance on public information. In the context of venture capital (VC) investments, Ewens and Rhodes-Kropf (2015) show that although both the VC partner and the firm can affect investment outcomes, the partner's human capital is a more important influence. Using a sample of Chinese mutual funds and fund managers, Huang and Wang (2015) also highlight the importance of controlling for managerial heterogeneity in fund performance analyses. The study shows that fund performance improves after hiring a manager with higher fixed effects. These studies indicate that unobservable manager attributes, which reflect managerial skills, can be captured by manager fixed effects.

### **2.3 Motivation for the Current Study**

Using samples that differ in terms of types of funds studied and sample period, past studies come to different conclusions regarding the impact of mutual fund team management structure and performance. The actual influence of team-management therefore remains a puzzle.

Previous studies acknowledge that there are differences in fund characteristics between team- and single-managed funds. These fund characteristics, such as fund age, fund size, and fund expenses, are often used as controls in the analyses to ensure that observed team management effects on fund outcomes were not driven by these differences in fund attributes. However, these studies directly compare funds that are managed by individual managers and teams of managers without taking into account the fact that the managers employed by these funds might also be different. Therefore, in addition to differences in samples, one alternative explanation to the mixed findings on the effect of team management is that previous studies do not accurately control for managerial attributes.

Other studies examining the influence of team management on fund outcomes seek to address this issue by controlling for observable managerial attributes, such as the gender of managers, manager seniority, and manager education backgrounds (e.g., Bär et al., 2010; Patel and Sarkissian, 2014). However, these studies do not control for unobservable managerial attributes that have shown to have a strong impact on fund performance and therefore do not answer the question whether, on average, a manager performs better in a single management structure or a team management structure. Consistent with recent literature that documents influence of individual unobservable managerial heterogeneities on fund performance, this study controls for manager fixed effects and fund fixed effects to isolate any possible impact of team management from the influence of the managers that comprise the teams and the funds that hired the teams.

### **3 Data and Variables**

#### **3.1 Main Data Source**

The main data source used in the study is Morningstar Direct, an institutional investment analysis platform offered by Morningstar, Inc. that provides comprehensive and survivorship-bias-free coverage of worldwide investments (Morningstar, 2016a). To facilitate comparison with the prior literature, I focus on diversified U.S. open-ended equity funds that primarily invest in U.S. domestic stocks. To study the relationship between fund management structure and fund performance, my sample includes actively-managed funds as managerial decisions are more likely to be reflected in fund return information. I exclude all sector funds as the portfolios of these funds are concentrated in particular industries and are therefore not diversified and directly

comparable<sup>4</sup>. I also exclude index funds and other funds that appear to follow passive investment strategies based on keywords in the funds' names<sup>5</sup>. As the study focuses on the possible influence of management structure on fund performance, funds which have missing management history are excluded from the sample (0.56% in the original sample).

### 3.2 Fund Characteristics

Starting from the 1990s, mutual funds have begun to offer different share classes from the same fund that appeal to different investors (Wermers, 2000). Morningstar Direct treats individual fund share classes separately and reports information on fund performance, total net assets under management, management fees and other fund characteristics at the individual share class level. However, different share classes of the same fund share the same portfolio manager(s) and the same underlying portfolio. The main differences between each share class offered by the same fund are in their expense and fee structures<sup>6</sup>. Without appropriate adjustment, the analysis might be biased due to multiple counting, which is especially relevant for recent periods as the majority of fund families have started offering products in the form of multiple share classes. To prevent multiple counting, I aggregate performance and other information

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<sup>4</sup> I exclude sector funds based on investment style categories that reflect their portfolio holding. These investment style category classifications are identified by Morningstar Direct based on the holdings composition in a fund's investment portfolio. I also exclude all funds that are not in the U.S. equity category group. For a detailed description about the investment objectives, refer to [http://www.morningstar.com/InvGlossary/morningstar\\_category.aspx](http://www.morningstar.com/InvGlossary/morningstar_category.aspx) and Morningstar (2016b)

<sup>5</sup> I classify funds that have the words such as "index", "S&P", "idx", "dow", "etf", and similar keywords that reflect passive management in their names as index funds. I check against reported investment strategies in fund prospectuses in cases involving ambiguity. I classify funds that follow enhanced index strategies as passive managed and I exclude them from the sample.

<sup>6</sup> The three commonly offered share classes are denoted as A, B and C. Class-A shares charge a front-end load and an annual 12b-1 fee of 25 to 35 basis points. Class-B and Class-C shares have no front-end fees but charge a higher 12b-1 fee and possibly a contingent deferred sales load upon exit (Nanda, Wang, & Zheng, 2009). The CRSP mutual fund database also treats individual share classes from the same mutual fund as separate observations.

related to individual mutual fund share classes at the mutual fund level using a unique fund identifier provided in Morningstar Direct.

Following prior studies (e.g., Wermers, 2000; Kosowski, Timmermann, Wermers and White, 2006), I take the value from the oldest share class offered by the fund for qualitative fund information such as the investment style category and fund inception date. Total net assets under management and monthly fund flow are obtained by aggregating at the fund level. For other quantitative information on the fund level, I take the total net assets-weighted average over the different share classes. These variables include the *monthly net return*, the *annual net expense ratio*, and the *turnover ratio*<sup>7</sup>. I calculate *fund size* as the fund's total net assets under management in millions of dollars, *family size* as the aggregated total net assets of all funds managed by a fund family complex (e.g. Blackstone), and *fund age* as the number of years between the inception date of the fund's oldest share class and the current month end.

### 3.3 Fund Performance

To measure fund performance, I use the estimated alpha from the four-factor model developed by Carhart (1997). Compared to raw return measures, the estimated four-factor alpha captures excess return that is not attributable to common investment styles adopted by funds. The estimated alpha measure facilitates comparison between funds with different investment styles and ensures that any observed performance differences

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<sup>7</sup> The *net return* (also referred to as the *total returns* by Morningstar) is net of a fund's total expense ratio, but not adjusted for sales and redemption charges (such as front-end and back-end loads). The *annual net expense ratio* is expressed as a percentage of total net assets under management, which measures fund management, administrative, marketing (12-1 fees) and other costs that are related to fund's operation, excluding transition costs. The *annual turnover ratio* is expressed as the minimum of the annual aggregated purchase or sale of securities as a percentage of total net assets, which measures the percentage of fund assets that are renewed.

As all *expense ratios* and *turnover ratios* provided by Both Morning or CRSP are extracted from fund annual reports, I allocate these annual ratios to monthly fund observations based on the period covered by the annual reports according to fund fiscal year-end months. Fiscal year-end information is provided by Morningstar. If the fund does not have fiscal year-end information, I assume that the fiscal year-end of the fund is December.

between single- and team-managed funds are not the result of differences in their exposure to common investment strategy. The four-factor  $\overline{Fund\ Alpha}$  for fund  $j$  in month  $t$  is estimated by conducting rolling-window regressions using monthly fund net returns from the preceding 12 months, and is represented by the intercept term  $\alpha_j$  in the following regression specification:

$$r_{j,t} - r_{f,t} = \alpha_j + \beta_{MKTRF,j} MKTRF_t + \beta_{SMB,j} SMB_t + \beta_{HML,j} HML_t \quad (1) \\ + \beta_{UMD,j} UMD_t + \epsilon_{it}$$

where  $r_{j,t}$  is the monthly fund net return<sup>8</sup>;  $r_{f,t}$ , the risk-free rate, is the one-month T-bill rate in month  $t$ ;  $MKTRF$ ,  $SMB$ ,  $HML$  and  $UMD$  are the monthly U.S. excess market return and returns on the size, book-to-market, and momentum portfolios, respectively<sup>9</sup>. To reduce the influence of outliers, I follow standard practice in the literature and winsorize the fund alphas at the top and bottom 1% of the distribution. I also measure *Volatility* of fund return by the standard deviation of monthly fund returns over the corresponding rolling window period in caputre fund risk. I exclude funds that do not have data on 24 consecutive monthly returns to ensure that fund four factor alphas can be reliably estimated and that each fund in the sample has at least 12 fund alpha observations<sup>10</sup>.

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<sup>8</sup> Instead of monthly fund net returns, I use monthly fund gross returns (i.e. fund net returns adjusted for fund expense ratio) to estimate fund four-factor alphas. In untabulated analyses, I repeat the analyses in the study using fund alpha estimated based on gross returns. The coefficients on the main variable of interest are very similar to the reported results.

<sup>9</sup> The data is obtained from Kenneth French's website: [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

<sup>10</sup> The Carhart (1997) four-factor model is commonly adopted in mutual fund studies to estimate fund risk-adjusted returns. The non-inclusive list of other studies that use the Carhart (1997) four-factor alpha in order to capture manager investment skill include Bär et al. (2010), Bliss et al. (2008), Chen et al (2004), Ding and Wermers (2012), Karagiannidis (2010), Massa et al. (2010), Parwada and Tan (2016); Patel and Sarkissian (2014), Tan and Sen (2016). Other common risk-adjusted fund performance measures include the CAPM (Jensen's) alpha, Fama-French three-factor alpha, and investment objective benchmark adjusted return. Studies that report result using different risk-adjusted performance measures typically find similar results using alternative performance measures (e.g., Chen et al., 2004; Karagiannidis, 2010; Massa et al., 2010)

### 3.4 Fund Flow

I obtain estimated monthly net fund flow from Morningstar Direct. Morningstar estimates monthly net fund flow using total net assets and fund net returns. The estimated net cash flow from or to investors for a month is the difference in beginning and ending total net assets that is not attributable to investment return, distribution and reinvestment. For months with distributions, to prevent underestimation of net cash flow by attributing asset growth to reinvestment rather than attributing that growth to cash flow, Morningstar adds back the distributions that were cashed out instead of reinvested.

I follow prior studies examining fund flows (e.g., Sirri and Tufano, 1998; Lou, 2012) in expressing mutual fund flows as a percentage growth in total net assets. I scale the estimated net flow obtained from Morningstar with previous month's total net assets under management to calculate *Fund Flow*. This measure reflects the external growth in total net assets, which represents the net demand for a mutual fund from mutual fund investors. A positive (negative) fund flow indicates that investors are adding (withdrawing) capital to the fund. To prevent the influence of outliers, I winsorize the flow measure calculated at the top and bottom 1% level.

### 3.5 Fund Team Management

Morningstar Direct reports detailed fund manager history at the fund level, which includes the full names of all the fund managers who ever worked at the fund, the date when the manager started taking part in the day-to-day management of the fund's portfolio and the date when the manager left the fund. An example of an individual fund manager record for a fund is as follows: Andy M. Baker worked at Citadel Large-Cap Growth fund from 2000/03/01 to 2005/03/31. Using the fund manager history, I am

able to determine the names of the fund managers who worked in any particular fund during a given month in the sample<sup>11</sup>.

I classify funds as being single-managed or team-managed based on the number of managers present at the end of a calendar month. When Morningstar Direct reports only one manager name at the end of a month, I classify that fund as single-managed for that month. When two or more fund managers are present in the fund at the end of a month, I classify the fund as team-managed for that month<sup>12</sup>. Although it is possible to identify the managers that comprise the teams, it is not possible to ascertain the contribution of each team member and to determine how the management responsibility is shared among the team members. Therefore in this study, I assume all members of the team contributed equally in the management of the fund portfolio. In other words, I attribute observed fund monthly returns and estimated fund monthly flows to all individuals listed as fund managers for each fund month<sup>13</sup>.

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<sup>11</sup> An alternative source used to obtain fund management information is the CRSP database. Several studies have reported that Morningstar databases and CRSP contain different information regarding the management structure of funds (e.g., Ding and Wermers, 2012; Massa et al., 2010; Patel and Sarkissian, 2014). These studies show that Morningstar is far more accurate and complete with regard to reporting manager information such as manager name and tenure start date. For more details about the managerial information offered in Morningstar Direct and CRSP, see Appendix A.

<sup>12</sup> Strictly speaking, all mutual funds are managed by teams. Apart from the fund managers, there are analysts and other support staff who collect and analyse information, which ultimately contribute to the investment process. In this study, I follow the definition specified by the U.S. Securities and Exchange Commission (SEC) and refer to fund managers as individuals who are ultimately responsible for the day-to-day management of the fund's portfolio (SEC, 2004). These individuals are assumed to have the most influence over the final investment decisions.

<sup>13</sup> An alternate approach is to identify the manager having the longest working history with the fund as the "leader" of the team and attribute fund performance to the leading manager (Ding and Wermers, 2012). This approach relies on the assumption that the manager with the longest tenure in a fund has the highest level of control of the fund and the most dominant influence over the decision-making process, while other listed managers do not play a significant role in the management of the funds.

In untabulated analyses, I follow Ding and Wermers (2012) and identify the lead-manager for each team-managed fund month. In the event of a tie (30.4% of the fund-month observations), I use manager industry experience to determine the lead managers, that is, I choose the manager who first becomes a fund manager of any fund or the manager who has managed more funds as the lead-manager. If the lead-manager is undeterminable, I randomly choose a manager to be the lead-manager (13.8% of the fund-month observations). I repeat the empirical analyses with lead-manager-fund month observations only and find consistent results.



I remove all fund-month observations for which the managers' names cannot be accurately identified (1.45% of the full sample). To ensure manager fixed effects can be accurately estimated, I require a fund manager to have worked continuously for at least 12 months to be included in the sample. To avoid temporary team arrangements, I also require all unique team combinations to have at least 12 months of continuous observations. The mean tenure for managers who manage funds individually is five years (median tenure 3.5 years), and the mean tenure for stable team arrangements is three years (median tenure 2.1 years). I calculate fund *manager tenure* as the number of years the manager has been hired by the fund that employs the manager in a given month, and *manager experience* in the asset management industry as the difference between the date when a fund manager started as a portfolio manager in a fund in the U.S. actively managed mutual fund universe and the current date, expressed in years.

Using the detailed fund manager history, I also identify fund managers that manage more than one fund simultaneously during a month in the U.S. actively managed open-ended equity fund industry. As shown in Agarwal, Ma, and Mullally (2015), these 'multitasking' fund managers are usually more experienced and have superior past performance. However, the authors argue that such multi-tasking arrangement also has an impact on subsequent fund performance, and leads to performance improvement in new funds managed by these multi-tasking managers but performance deterioration in the original funds managed by them due to increased distraction. Having management roles in multiple funds might also increase manager visibility to the investors, and might serve as an indicator of superior ability to the investors and influence fund flow. In the following analysis, I control for manager-multitasking as a time-variant managerial attribute.

My final sample covers 3,602 funds and 6,518 fund managers with 927,495 manager-fund-month observations from 1992 to 2015. The sample includes funds that survived until the end of the sample period and funds that became obsolete due to mergers or liquidation. Overall, 170,408 observations are from single-managed funds, and 757,087 are from team-managed funds.

### 3.6 Summary Statistics

#### 3.6.1 Distribution of Management Structure

Figure 1 presents the evolution of management structure over time. It shows the percentage of single- and team-managed funds in each year included in the sample, along with the total number of funds in each sample year. The total number of actively managed funds increased steadily over the years from 440 in the beginning of the sample period and reached a maximum in 2007 with 2,221 funds. The number of funds decreased after 2007, possibly due to the influence of the Global Financial Crisis. At the end of the sample period, 1,556 funds are still alive in 2015.

In the earlier years, the majority of the funds are managed by a single manager. Consistent with other studies (e.g., Bär et al., 2010; Massa et al., 2010), the proportion of team-managed funds increases dramatically over the sample period. At the end of 1992, only 34% of the funds in the sample are classified as team-managed. By 2010, the proportion of team-managed funds has doubled to 66% of in which the proportion of team-managed funds stabilises at around 70%. Overall, 58% of the funds contained in the sample are managed by teams.

Panel A, Panel B and Panel C of Table 1 report the distribution of fund-months in terms of their investment style categories and the percentage of single- and team-managed fund-months in each category, respectively. Fund investment styles are

identified based on the composition of fund portfolio holdings (Morningstar, 2016b). Funds are divided into categories to reflect their investment in stocks with different market capitalization groups (large-, mid- and small-cap, see Panel A) and in stocks with different book-to-market ratio groups (value, blend and growth, see Panel B), as well as nine ( $3 \times 3$ ) investment style categories that reflect the interaction between market capitalization and book-to-market bands (see Panel C) (Morningstar, 2016b).

As shown in Table 1 Panel A, most of the fund-months in the sample consist of funds that invest in large capitalization stocks (53% of the full sample). The proportion of team-managed funds of the each market capitalisation categories is very close to the overall proportion of team-managed funds, which shows that the likelihood of a fund to adopt team management does not differ materially across the three market capitalisation categories. Panel B shows that the funds in the sample tend to follow growth-orientated investment strategies (40% of the full sample). Compared to other book-to-market categories, funds that are value-orientated are slightly more likely to be managed by teams. Looking at the nine ( $3 \times 3$ ) investment style categories, Panel C shows that funds that invest in medium and small capitalization stocks are more likely to follow growth investment strategies. Out of the nine investment style categories, team management is more prevalent in mid cap value and small-cap blend funds. In contrast, funds that follow mid-cap blend investment style on average are less likely to adopt team management.

For each month in the sample, I divide all funds into performance and size quintiles based on their estimated four-factor alpha and total net assets. Panel D and Panel E report the proportion of team- and single-managed fund-months in different fund performance and fund size quintiles. Panel D shows that funds with extremely low or high risk-adjusted performance are more likely than funds in other performance

quintiles to adopt single management. This shows that team-managed funds on average achieve less extreme performance outcomes than single managers, which is consistent with the findings in Bär et al. (2010). Panel E shows that there are fewer team-managed funds in the smallest size quintile. This observation is in line with the view that larger funds (measured by total net assets under management) require more managerial resources and are hence more likely to be team-managed. However, compared to medium-sized funds, funds in the largest size quintile are also less likely to be managed by teams.

Panel F of Table 1 divides the management teams into different size categories based on the number of managers listed at month ends. Management teams are categorised of teams with two, three, four, five and six or more depending on the number of managers listed at the end of a fund month<sup>14</sup>. Overall, the largest proportion of teams in the sample consists of two managers (28% of the full sample). The second largest group, which is about half the size of the largest group, is teams consisting of three managers.

### 3.6.2 Characteristics of Team- and Single-Managed Funds

Table 2 presents summary statistics for several relevant characteristics for team- and single-managed funds. In addition, Table 2 reports the results for tests of differences in mean and median for each variable between the two groups. Table 2 shows that team-managed funds differ from single-managed funds in several aspects. Compared to single-managed funds, team-managed funds tend to have higher assets under management. The mean family size is larger for single-managed funds, but the

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<sup>14</sup>It is possible that the team structure and the interaction between team members are different in extremely large teams. To alleviate the concern that the observed results are driven by extremely large teams, I remove team-managed fund observations with six or more managers and repeating the empirical tests in this study. I find very similar results (untabulated) after the modification.

median value is larger for team-managed funds. Although fund age appears to be statistically different between team- and single-managed funds both in terms of the mean and the median, the differences in the age are marginal. Team-managed funds also exhibit a lower annual turnover ratio and a lower annual expense ratio. The latter possibly reflects the downward trend in the average expense ratio of actively managed funds as a larger proportion of funds are managed by teams in the recent years. (Investment Company Institute, 2016). The statistics are consistent with the documented difference between team- and single-managed funds in prior studies on mutual fund team management (e.g., Bär et al., 2010; Karaginidis, 2010; Patel and Sarkissian, 2014; Tan and Sen, 2016).

With regards to fund performance, average fund net return is positive and average risk-adjusted return (fund four-factor alpha) is negative for both team- and single-managed funds. Compared to single managed funds, the mean net return of funds that adopted team management are lower but the median value is higher. The difference in mean fund alpha between the two types of funds is 0.4 basis point per month (difference in median is 0.9 basis points). Team-managed funds, on average, are associated with a lower fund inflow.

Finally, compared to managers in single-managed funds, managers in team-managed funds are marginally less experienced in the U.S. open-end mutual fund industry compared to single-managed funds. Fund managers who work in teams also have shorter tenure and tend to manage more funds simultaneously.

Table 3 shows the correlation matrix for the fund and managers characteristics explanatory variables used in the analyses. The correlation analysis shows a high degree of correlation between  $\ln(\text{Fund Size})$  and  $\ln(\text{Family Size})$ , which is unsurprising as

the two variables both are measures of size of assets under management. Similarly, a high correlation exists between the two manager experience measures: manager asset management industry experience,  $\ln(Mgr\ Experience)$  and manager fund tenure,  $\ln(Mgr\ Tenure)$ . I address the multicollinearity concerns by excluding fund family size in the following analyses as the impact of fund family is captured by fund fixed effects controlled in the model. I also exclude manager industry experience from the multi-variate analyses as several studies document that there is no relation between manager industry experience and fund performance (e.g. Bliss and Potter, 2002). In unreported analyses, I find that adding these variables in the following analyses has virtually no effect on the variables of interest and the explanatory power of the models.

## **4 Methodology**

The previous section shows that team- and single-managed funds do differ in terms of fund and manager characteristics. These characteristics are also shown to influence fund outcomes in previous studies (e.g., Chen et al., 2004; Chevalier and Ellison, 1999). To ensure any observed team management effect is not driven by differences in fund and manager characteristics, it is necessary to control for these variables when assessing the impact of team management on fund performance and fund flow.

To assess the effect of team management on mutual fund risk-adjusted performance, I adopt a multivariate regression approach to control for fund characteristics that have been shown to impact on fund performance. I also control for past fund flow in the preceding 12 months and time-variant manager attributes. In addition to controlling for time fixed effects, I also add manager fixed effects and fund fixed effects to control for any observable and unobservable time invariant fund and

managerial heterogeneities that might influence fund performance. The baseline regression specification is as follows:

$$\begin{aligned}
\overline{Fund\ Alpha}_{i,j,t-12:t-1} &= \beta_0 + \beta_1 TEAM_{j,t} + \beta_2 \ln(Fund\ Size)_{j,t} \\
&+ \beta_3 \ln(Fund\ Age)_{j,t} + \beta_4 Expenses_{j,t} \\
&+ \beta_5 Turnover_{j,t} + \beta_6 Volatility_{j,t-12:t-1} \\
&+ \beta_7 \ln(Mgr\ Tenure)_{i,j,t} + \beta_8 Multi\ Fund_{i,t} \\
&+ \sum_{m=t-12}^{t-1} \beta_m Fund\ Flow_{j,m} + \theta_i + \phi_j + \mu_t + \epsilon_{j,t}
\end{aligned} \tag{2}$$

In the equation,  $i$  denotes the fund manager,  $j$  the mutual fund, and  $t$  the calendar month. Managers ( $i$ ) can change funds over time and it is possible for manager  $i$  to manage more than one fund simultaneously in a given month.  $\overline{Fund\ Alpha}_{i,j,t-12:t-1}$  is the estimated monthly four-factor alpha for fund  $j$  in month  $t$  based on the past 12 month returns,  $TEAM_{j,t}$  is a dummy that equals to one if fund  $j$  is managed by more than one manager in month  $t$  and zero otherwise.  $\ln(Fund\ Size)$  and  $\ln(Fund\ Age)$  are the natural logarithm of funds size and fund age.  $Expenses$  and  $Turnover$  are the fund's expense ratio and turnover ratio.  $Volatility$  is measured by the standard deviation of a fund's net return over the past 12 months.  $\ln(Mgr\ Tenure)$  is the natural logarithm of fund manager's tenure in fund  $j$ .  $Multi\ Fund$  is a dummy that equals one if manager  $i$  managed more than one fund in month  $t$ .  $Fund\ Flow$  is the monthly net capital flow into or out of fund  $j$ , expressed as a percentage of total net assets.  $\phi_j$ ,  $\theta_i$  and  $\mu_t$  denote vectors of fund, manager, and time (year-month) indicator variables, respectively, used to control for fund, manager and time fixed effects.

As the monthly four-factor alpha is estimated based on past fund performance, I remove the first 12 months of observations after any change in management member(s) to ensure the estimated alpha is correctly attributed the current fund management member(s)<sup>15</sup>. Because of these requirements, some funds and fund managers were dropped from the sample for this analysis and the sample contains 3,595 funds, 6,378 managers and 651,458 manager-fund- months (whereas in the full sample, there are 3,602 funds, 6,518 managers, and 927,495 manager-fund-months).

I also examine the impact of team management on fund risk after controlling for fund and manager characteristics. I use a similar multivariate model to assess the relationship between fund risk and fund management structure:

$$\begin{aligned}
 & Volatility_{i,j,t-12:t-1} \\
 & = \beta_0 + \beta_1 TEAM_{j,t} + \beta_2 \ln(Fund\ Size)_{j,t} \\
 & + \beta_3 \ln(Fund\ Age)_{j,t} + \beta_4 Expenses_{j,t} \\
 & + \beta_5 Turnover_{j,t} + \beta_6 \ln(Mgr\ Tenture)_{i,t} \\
 & + \beta_7 Multi\ Fund_{i,t} + \theta_i + \phi_j + \mu_t + \epsilon_{j,t}
 \end{aligned} \tag{3}$$

where fund risk is measured by the volatility of monthly net fund returns over the past 12 months. Other fund and manager characteristics explanatory variables and fixed effects are as explained above. Similar to the analyses on fund performance, I also remove the first 12 months of observations after any changes in managers hired by the fund.

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<sup>15</sup> Note that 12 month observations are removed after management structure changes (from single to team-managed or vice versa), they are also removed after any changes in listed managers for the fund to ensure the four-factor alpha is estimated using past fund returns that are only attributable to the then current managers.



To test whether fund flows differ between single- and team- managed funds, I also examine the relation between fund management structure and fund flow in a multivariate setting. Similar to the analyses above, I control for fund characteristics that might affect fund flow, as well as fund and manager fixed effects. Studies show that mutual fund flows are predicted by past fund performance, total flow into funds with the same investment objective (e.g., Choi, Kahraman and Mukherjee, 2015), and past flows (e.g., Coval and Stafford, 2007; Lou, 2012). I therefore also include aggregate fund investment objective flow and fund flows over the preceding 12 months as control variables in the baseline regression model for presented below.

$$\begin{aligned}
Fund\ Flow_{i,j,t} &= \beta_0 + \beta_1 TEAM_{j,t} + \beta_2 \ln(Fund\ Size)_{j,t} \\
&+ \beta_3 \ln(Fund\ Age)_{j,t} + \beta_{45} Expenses_{j,t} \\
&+ \beta_5 Turnover_{j,t} + \beta_6 Obj\ Flow_{j,t} + \beta_7 Volatility_{j,t} \quad (4) \\
&+ \beta_8 \overline{Fund\ Alaph}_{j,t-12:t-1} + \beta_9 \ln(Mgr\ Tenture)_{i,t} \\
&+ \beta_{10} Multi\ Fund_{i,t} + \sum_{m=t-12}^{t-1} \beta_m Fund\ Flow_{j,m} + \theta_i \\
&+ \phi_j + \mu_t + \epsilon_{j,t}
\end{aligned}$$

where  $Fund\ Flow_{i,j,t}$  represents the fund flow as a percentage of previous month's total net assets value entering or leaving fund  $j$  where manager  $i$  is employed during month  $t$ .  $TEAM$  is an indicator dummy which equals to one if the fund is managed by a team.  $Obj\ Flow$  is the aggregated contemporaneous total flows into the corresponding fund investment style category. Other explanatory variables and fixed effects are as explained above.

## 5 Empirical Results

### 5.1 The Influence of Fund Management Structure on Fund Performance

#### 5.1.1 Fund Risk-adjusted Return and Team Management

Table 4 presents the results of the base model and compares the effect of team management on the risk-adjusted performance of mutual funds. Column (1) shows the results for regression (2). Notably, the coefficient estimate on the main variable of interest *TEAM* is insignificant, which indicates that after taking into account fund and managerial heterogeneities, fund management structure does not influence fund performance<sup>16</sup>. This result is consistent with Bliss et al. (2008) and Prather and Middleton (2002, 2006). From the perspective of individual fund managers, it indicates that, on average, for the same manager operating in the same fund, the manager's performance is not affected by whether (s)he manages a fund individually or shares the management responsibility with a team<sup>17</sup>.

To address the possible autocorrelation concern of using a dependent variable (*Fund Alpha*) that is estimated with rolling window regressions using overlapping windows, I following Kacperczyk and Seru (2007) and Han et al. (2012) and compute the realised alpha in a given month as an alternative risk-adjusted fund performance measure. To calculate a fund's realised alpha (*Realised Alpha*) in a given month, I

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<sup>16</sup> To test for the size of team management effect that can be detected by the model, I use a simulated alpha measure based on the actual distribution of *Fund Alpha* of individual funds and impose various levels of imposed team management effect. The lowest level of team management effect that is picked up by the model is a difference in *Fund Alpha* of 0.005% per month between team- and single-managed funds. The results of the test of the ability of the model to pick up differences in *Fund Alpha* due to the *TEAM* variable are in Table 9.

<sup>17</sup> In tabulated tests, I lag the fund characteristics including fund size, fund age, fund expense, and fund turnover to avoid any possible simultaneity concerns. The coefficients on the main variable of interest do not materially change as a result.

first calculate the expected return calculated using the fund four-factor betas estimated using the preceding 12 months of fund returns and then subtract this expected return from the observed fund net return:

$$\begin{aligned}
 \text{Realised Alpha}_{j,t} & \\
 &= r_{j,t} - r_{f,t} - \hat{\beta}_{MKTRF,j,t} MKTRF_t - \hat{\beta}_{SMB,j,t} SMB_t \quad (5) \\
 &\quad - \hat{\beta}_{HML,j,t} HML_t - \hat{\beta}_{UMD,j,t} UMD_t
 \end{aligned}$$

where  $r_{j,t}$  are the return on fund  $j$  in month  $t$ , and  $MKTRF_t$ ,  $SMB_t$ ,  $HML_t$ ,  $UMD_t$  and  $r_{f,t}$  are the contemporaneous return on the market, the size portfolio, the book-to-market portfolio, the momentum portfolio and the risk-free asset, respectively, and  $\hat{\beta}_{MKTRF,j,t}$ ,  $\hat{\beta}_{SMB,j,t}$ ,  $\hat{\beta}_{HML,j,t}$ , and  $\hat{\beta}_{UMD,j,t}$  are the estimated fund four-factor betas using the previous 12 months of fund returns correspondingly.

Column (3) of Table 4 shows the results of the base model using *Realised Alpha* as the fund performance measure to assess the impact of team management. Similar to the findings using  $\overline{Fund\ Alpha}$ , the insignificant estimate on *TEAM* shows that team management has no significant impact on fund performance.

The results for the control variables are consistent with previous studies. *Fund Size* has a detrimental effect on both fund performance measures due to possible diseconomies of scales and hierarchical cost (e.g., Chen et al., 2004). *Fund Age* is positively correlated with past fund alpha, which may reflect the documented high performance among young funds (e.g., Blake and Timmermann, 1998). However, *Fund Age* is negatively correlated with fund realised alpha. I find that funds managed by managers with longer tenure are associated with poorer performance (Gottesman and Morey, 2006).

Interestingly, mutual fund manager multi-tasking is shown to have a negative impact on fund performance overall. As manager fixed effects are controlled for in the analyses, the results show that compared to managing only one fund, a fund manager's performance deteriorates on average when managing multiple funds simultaneously due to possible distractions from multi-tasking.

I also examine the effect of team size on fund performance. While there is no clear indication of the optimal number of managers in a team, previous research that examines the effect of team size shows that larger teams often perform worse than smaller teams (Patel and Sarkissian, 2014; Parwada and Tan, 2016). To investigate whether team size has an effect on performance after controlling for manager heterogeneities, I split the *TEAM* dummy into separate dummy variables based on the size of the teams. *TEAM2*, *TEAM3*, *TEAM4* are dummy indicators that represent teams consist of two managers, three managers, and four or more managers respectively. Table 4 Columns (2) and (4) reports the results after this modification, using  $\overline{Fund\ Alpha}$  and *Realised Alpha* as performance measures, respectively. The coefficient estimates of the three team size dummy variables are all insignificant for both performance measures, which indicates that the effects of teams with different sizes on fund performance do not differ. Overall, the results in Table 4 suggest that team-management has no effect on fund performance, regardless of the number of managers involved in the team<sup>18</sup>.

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<sup>18</sup> It is not possible to separately estimate the manager fixed effects and fund fixed effects for managers that never worked for more than one fund and for funds that never hire any other managers during the sample period. It is possible, however, to separately estimate the fixed effects for every fund and manager contained in a sample by applying the method developed by Abowd, Kramarz, and Margolis (1999) through the use of connected groups. I form connected groups based on manager-fund pairs that appear in the sample and test the baseline models with the largest connected sample of funds and managers. The results on the main variable of interest, *TEAM*, do not change. More details about the formation of the connected groups and estimated manager fixed effects can be found in Appendix B.

### 5.1.2 Fund Risk and Team-Management

In this section, I examine the relationship between management structure and fund risk using a similar approach as in the previous section. Table 5 Column (1) reports the results of the base regression. In contrast to previous studies that find team management is associated with lower return variability measured in both time series volatility and cross-sectional volatility (e.g. Bär et al., 2010; Bilss et al. 2010), I do not find a significant impact of team on funds' return volatility after controlling for fund- and manager-specific attributes. This is consistent with Patel and Sarkissian (2014), who also report that team-managed funds do not display a different level of risk when compared to single-managed funds, despite the fact that they do not control for fund and manager fixed effects.

The results for the controlled variables are generally consistent with previous studies. I find that funds with a larger size, younger funds and funds with high turnover are associated with significantly higher risk (Patel and Sarkissian, 2014). The results show that managers with longer tenure exhibit lower risk. Manager multi-tasking arrangements, however, does not seem to affect fund risk.

As fund volatility is estimated using 12 fund monthly returns on overlapping rolling windows, the results in Table 5 Columns (1) and (2) do use overlapping observations giving rise to autocorrelation. To address this concern, I replace the dependent variable used in the base regression with the squared fund net return (Table 5 Column (3)) and the absolute value of fund net return (Table 5 Column (5)) to capture the overall variability in fund monthly returns. Similar to the finding above, team management is not found to have a significant impact on the variability in fund returns. These results indicate that fund risk does not differ when a manager manages a fund individually and when this manager manages this fund with a team.

Similar to the previous section, I again split the *TEAM* dummy based on the size of teams. The results of the estimation of the impact of team size on fund risk is reported in Table 6 Columns (2), (4) and (6). There is no evidence that the impact of team on fund risk varies according to the number of managers for any of the three different measures of fund return variability. In sum, Table 5 shows that team management does not have an effect on fund risk.

## 5.2 The Influence of Fund Management Structure on Fund flow

### 5.2.1 Fund Flow and Team-Management

Table 6 reports the results of the estimation of the impact of team management on fund flow. After controlling for fund and manager characteristics that may impact fund flow, the results in Table 6 Column (1) show that fund flow is not influenced by team management. This result contrasts with that in Massa et al. (2010) who find that single-managed funds receive greater flow, and that in Patel and Sarkissian (2014) who detect a positive relationship between team management and fund flows. As the regression controls for fund and fund manager fixed effects, the insignificant coefficient on the *TEAM* dummy indicates that on average, the same manager does not attract more fund flow when the manager is working with a team or by himself/herself in the same fund. Alternatively, the regression results also show that funds do not attract more flow as a result of adopting team management.

Consistent with previous studies (e.g., Choi, Kahraman and Mukherjee (2015)), both fund size and age are negatively related to fund flow. The positive and significant coefficient on past performance and the negative coefficient on return volatility indicate fund investor performance chasing behaviour and overall risk-aversion of mutual fund investors documented in past studies (Sirri and Tufano, 1998). The relative performance

of mutual funds against other funds in the same investment style category is a significant determinant of fund flow (e.g., Elton, Gruber, and Blake, 2003; Sirri and Tufano, 1998). Manager tenure does not have an effect on fund flow, whereas multi-tasking managers on average receive less flow. This result indicates that fund flow received by a manager is lower when managing multiple funds compared to managing only one fund. This may suggest that fund investors move away from funds managed by managers that are potentially distracted by multi-tasking management arrangements.

Following previous sections, I also test for the effect of team size on fund flow. Column (2) of Table 7 reports the results of the estimation of the modified fund flow regression model. After correcting for other fund and managerial characteristics that may have influenced fund flows, the negative and significant coefficient on *TEAM4* indicates that compared to managing funds individually, joining teams that consist of four people or more people results in a decrease of 0.14% per month for a fund manager (based on the average size of team-managed funds of \$1,783.82 million, the decrease in dollar flow is around \$2.50 million per month). This might be attributable to the fact that compared to single-managers that receive greater association with the fund portfolio, managers in teams are less likely to be identified with the funds. Previous studies also suggest that the media favours single managers over teams of managers as single managers are shown to receive more media mention (Massa et al. 2010). As a result, it is more difficult for funds to promote teams of managers than single managers. Managers in larger teams therefore receive less attention from fund investors, which may ultimately result in flow reduction.

To show the importance of controlling for manager fixed effects, I repeat the above analyses without controlling for manager fixed effects (results are untabulated) and found no evidence that fund managed by teams with four or more managers is

associated with a different level of fund flow. This illustrates the fact that without taking into account of managers' ability to attract flow, compared to single-managed funds, flow received by funds that are managed by large management teams do not differ significantly. However, compared to managing funds individually, a manager received less flow on average after joining a large team after controlling for manager fixed effects.

### 5.2.2 Fund Flow and Management Structure Changes

It is possible that investor reaction to different management structures is concentrated around management structure changes (from single- to team-managed, or vice versa). To test for changes in investor demand around these events, I identify the exact month in which a fund switches from single- to team-managed (1,045 cases, denoted as *Single to Team*) and vice versa (714 cases, denoted as *Team to Single*) and analyse changes in fund flow six months before and after the month of management structure change<sup>19</sup>. I modify the base regression (4) to include dummy variables that indicate these months around structure change events (*Single to Team*<sub>-6</sub> to *Single to Team*<sub>+6</sub>, and *Team to Single*<sub>-6</sub> to *Team to Single*<sub>+6</sub>) to capture any changes in fund flows during these months.

Table 7 shows the results for this analysis. The findings are somewhat surprising. Investors, on average, allocate significantly lower flows to funds that change from single- to team-managed during the month when the transition occurred (0.43% or \$7.67 million lower based on the average of total net assets), compared to all other months in the sample. On the other hand, flow is also significantly lower in months surrounding months when funds change from team- to single-managed (around 0.36%

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<sup>19</sup> To avoid temporary arrangements, I require the new management structure to be stable for at least 12 months after the initial transition to be identified as a fund management structure change.



(\$4.42 million based on the average size of single-managed funds of \$1,200.47 million) and 0.45% (\$5.40 million) lower three and four months before the change and 0.33% (\$3.96 million) in the months after). These findings may indicate negative investor reaction towards managerial changes, as previous studies document that managerial changes in general are associated with fund underperformance (e.g. Khorana, 1996; Wermers, Wu, and Zechner, 2007).

### 5.2.3 Performance-Flow Relationship and Fund Management Structure

The relationship between fund performance and fund flow is well-documented in the past literature. In this section, I further investigate whether fund management structure influences the relationship between past fund performance and flow. Sirri and Tufano (1998) show that the fund performance- flow relationship is non-linear, where investors invest disproportionately more in funds that performed extraordinarily well compared to their peers. In addition, funds that charge higher total fees display a much stronger performance-flow relationship due to possible higher marketing effort (Sirri and Tufano, 1998). As the media pays more attention to single fund managers (Massa et al. 2010), the marketing benefit received by single fund managers may cause fund performance-risk relationship to differ between funds adopting different management structures.

To test for the effect of team management on the observed performance-flow relationship, I first divide funds within each investment style categories into quintiles based on their past 12-month four-factor alpha ( $\overline{Fund\ Alpha}$ ). I then create indicator variables  $INDMID$ , which equals one for funds that belong in the three middle performance quintiles and zero otherwise, and  $INDHIGH$ , which equals to one for funds that belong in the highest quintile and zero otherwise (the lowest performance

group is omitted and serves as the benchmark). The regression specification is similar to the base model specification, except that the risk-adjusted performance measure,  $\overline{Fund\ Alpha}$ , is replaced by the performance group indicator variables and the performance and team interaction terms. Column (1) of Table 8 shows the results of the analysis. The positive estimates on indicators *INDMID* and *INDHIGH* confirm that investors are less likely to invest in funds that had a low performance, and that funds that have achieved top performance attract more fund flows. The estimate on *TEAM* remains insignificant, which shows that the impact of team does not change after taking the convexity of the fund performance-flow relationship into account.

I further include two interaction terms between *TEAM* and each of the two performance indicator variables, *INDMID* and *INDHIGH*. In Table 8 Column (2) the negative estimates on the interaction terms of performance indicators and *TEAM* show that investors, on average, allocate lower flow to high performing team-managed funds compared to their single-managed counterparts. The coefficients on the interactions show this difference in fund flow attracted by team- versus single-managed funds is more prominent in funds that have achieved extreme superior performance. In contrast, the insignificant estimate on *TEAM* indicates that investor reaction does not differ between team- and single-managed funds that generate low performance in the past (the benchmark group).

In order to test the impact of team on the sensitivity of the performance-flow relationship at various levels of performance, I follow Sirri and Tufano (1998) and adopt a piecewise linear specification. For each fund *j* in month *t*, I assign a fractional performance rank according to its past 12-month four-factor alpha ( $\overline{Fund\ Alpha}$ ) relative to all other funds with the same investment style category, the rank,

$PerfRank_{j,t}$ , ranges from zero (low performance) to one (high performance).  $LOW_{j,t}$  is defined as  $\min(PerfRank_{j,t}, 0.2)$ ,  $MID_{j,t}$  is defined as  $\min(PerfRank_{j,t} - LOW_{j,t}, 0.6)$ , and  $HIGH_{j,t}$  is defined as  $PerfRank_{j,t} - MID_{j,t} - LOW_{j,t}$ <sup>20</sup>. I replace the performance group indicator variables with the three fractional performance rank variables that corresponds to different levels of performance. The coefficients on these decomposed fractional ranks show the sensitivity of the performance-flow relationship in different fund performance groups.

Table 8 column (3) reports the results for the modified model. Fund performance improvements within the highest performance quintile attracted much higher inflows compared to improvements within lower performance quintiles. In contrast to Sirri and Tufano (1998) who find no relationship between past performance and fund flows to funds in the lowest performance quintile, I find a positive and significant coefficient for the lowest-performing funds although smaller in size. This result is consistent with the findings in Choi et al. (2015), Parwada and Tan (2016) and others, which reflect an investor belief that poorly performing funds will improve their lower performance in the future (Bliss et al., 2008).

To test for differences in fund flow sensitivity on fund performance rank between team- and single-managed funds in each performance group, I also interact the fractional performance ranks ( $LOW$ ,  $MID$  and  $HIGH$ ) with  $TEAM$ . Column (4) of Table 8 shows the results of the analysis. Similar to the findings above, the interaction of  $HIGH$  and  $TEAM$  is associated with a significant negative coefficient, which indicates that fund flows from investors are less sensitive to the extreme superior performance achieved by a manager in team compared to when this manager is a single-

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<sup>20</sup> For example, for a fund with a performance rank of 0.15,  $LOW$  is 0.15,  $MID$  is 0, and  $HIGH$  is 0; whereas for a fund with a rank of 0.85,  $LOW$  is 0.20,  $MID$  is 0.60, and  $HIGH$  is 0.05.

manager. Moving 10 percentile rank up in the highest performance quintile (e.g., from 85<sup>th</sup> rank to 95<sup>th</sup> rank), a manager receive on average 0.14% lower flow (\$2.50 million based on the average total net assets of team-managed funds) when in a team compared to being single. On the other hand, the sensitivity of flow to performance rank does not differ between funds managed by teams- or single-managers in the middle or low performance group.

Overall, the difference in sensitivity in fund flows to performance may indicate that compared to single-managed funds, funds managed by teams attract less attention from investors. These results are consistent with the findings in Massa et al. (2010) and Sirri and Tufano (1998) that single-managed funds attract more media attention and that funds with more market expenses have a much sharper performance flow sensitivity. Therefore, any superior performance achieved are possibly more visible to fund investors.

## **6 Conclusion**

Over the past few decades, team management has replaced single management to become the dominant management structure observed in the mutual fund industry. However, findings from prior studies on the effect of team management on fund outcomes are not consistent. Apart from differences in samples (fund types and periods), one possible explanation for the observed puzzling findings is the absence of controls for managerial heterogeneity which has been shown to play an important role in determining fund performance.

I re-examine the influence of team management. Using accurate managerial information obtained from Morningstar Direct, I track the movements of mutual fund managers between funds throughout their fund management career. To examine the

impact of team management on fund outcomes, I control for fund and manager fixed effects as well as other fund and managerial characteristics to correct for fund and managerial heterogeneities. I show that fund performance and risk do not differ significantly between team- and single-managed funds. The impact of team on performance and risk also does not vary across different team size.

I also compare team- and single-managed funds' ability to attract mutual fund flow to test whether investors have a preference for a certain type of management structure. Similar to the results for performance and risk, I find that a manager in a team, on average, does not have a different fund flow compare to the same manager when (s)he is a single-manager. However, the size of the teams does matter for fund flow. Managers that join larger teams are associated with lower fund flow, which might be due to the fact that managers operating in larger teams are less identifiable and visible. Compared to single-managers (single-managed funds), team-managers (team-managed funds) that have a lower flow-performance sensitivity, possibly due to lower investor attention.

Given the lack of superior risk-adjusted performance and the inability to attract additional fund flow on average, the sharp growth in popularity of team management in the mutual fund industry still remains a puzzling phenomenon.

**Table 1: Summary Statistics of Mutual Funds Management Structure**

This table shows the summary statistics of fund management structure of diversified domestic equity actively-managed mutual funds in the U.S. from 1992 to 2015. The table reports the distribution (the number and the percentage) of team- or single-managed fund month observations, where the observations are classified as managed by a team or a single manager based on the number of manager(s) listed in a fund at month ends. Panel A, Panel B and Panel C report the distribution of team- or single-managed fund month observations in each investment market capitalisation groups, book-to-market groups, and 3 x 3 investment style categories. The investment categories are defined based on fund holdings. Panel D and Panel E reports the distribution of team- or single-managed fund month observations in each fund performance and fund size quintile, where funds are divided into performance and size quintiles in each month based on their estimated four-factor alpha and total net assets, respectively. Panel F reports the distribution of fund month observations managed by one, two, three, four, five and six or more fund managers.

*Panel A: Distribution of single- and team-managed fund-month by market capitalization groups*

|              | Team-Managed   |            | Single-Managed |            | Total          | Percent     |
|--------------|----------------|------------|----------------|------------|----------------|-------------|
|              | Number         | Percent    | Number         | Percent    |                |             |
| Large        | 123,901        | 58%        | 89,921         | 42%        | 213,822        | 53%         |
| Mid          | 55,346         | 57%        | 41,961         | 43%        | 97,307         | 24%         |
| Small        | 56,166         | 59%        | 38,526         | 41%        | 94,692         | 23%         |
| <b>Total</b> | <b>235,413</b> | <b>58%</b> | <b>170,408</b> | <b>42%</b> | <b>405,821</b> | <b>100%</b> |

*Panel B: Distribution of single- and team-managed fund-month by book-to-market groups*

|              | Team-Managed   |            | Single-Managed |            | Total          | Percent     |
|--------------|----------------|------------|----------------|------------|----------------|-------------|
|              | Number         | Percent    | Number         | Percent    |                |             |
| Value        | 66,577         | 60%        | 44,144         | 40%        | 110,721        | 27%         |
| Blend        | 75,495         | 57%        | 56,120         | 43%        | 131,615        | 32%         |
| Growth       | 93,341         | 57%        | 70,144         | 43%        | 163,485        | 40%         |
| <b>Total</b> | <b>235,413</b> | <b>58%</b> | <b>170,408</b> | <b>42%</b> | <b>405,821</b> | <b>100%</b> |

*Panel C: Distribution of single- and team-managed fund-month by 3x3 investment objectives*

|              | Team-Managed   |            | Single-Managed |            | Total          | Percent     |
|--------------|----------------|------------|----------------|------------|----------------|-------------|
|              | Number         | Percent    | Number         | Percent    |                |             |
| LV           | 38,570         | 60%        | 26,113         | 40%        | 64,683         | 16%         |
| LB           | 43,644         | 58%        | 31,898         | 42%        | 75,542         | 19%         |
| LG           | 41,687         | 57%        | 31,910         | 43%        | 73,597         | 18%         |
| MV           | 14,040         | 61%        | 8,832          | 39%        | 22,872         | 6%          |
| MB           | 13,890         | 52%        | 12,742         | 48%        | 26,632         | 7%          |
| MG           | 27,416         | 57%        | 20,387         | 43%        | 47,803         | 12%         |
| SV           | 13,967         | 60%        | 9,199          | 40%        | 23,166         | 6%          |
| SB           | 17,961         | 61%        | 11,480         | 39%        | 29,441         | 7%          |
| SG           | 24,238         | 58%        | 17,847         | 42%        | 42,085         | 10%         |
| <b>Total</b> | <b>235,413</b> | <b>58%</b> | <b>170,408</b> | <b>42%</b> | <b>405,821</b> | <b>100%</b> |

*Panel D: Distribution of single- and team-managed fund-month by fund performance*

|              | Team-Managed   |            | Single-Managed |            | Total          | Percent     |
|--------------|----------------|------------|----------------|------------|----------------|-------------|
|              | Number         | Percent    | Number         | Percent    |                |             |
| 1 (Low)      | 44,693         | 55%        | 36,299         | 45%        | 80,992         | 20%         |
| 2            | 47,186         | 59%        | 33,161         | 41%        | 80,347         | 20%         |
| 3            | 47,958         | 60%        | 32,036         | 40%        | 79,994         | 20%         |
| 4            | 48,320         | 60%        | 32,594         | 40%        | 80,914         | 20%         |
| 5 (High)     | 47,256         | 57%        | 36,318         | 43%        | 83,574         | 21%         |
| <b>Total</b> | <b>235,413</b> | <b>58%</b> | <b>170,408</b> | <b>42%</b> | <b>405,821</b> | <b>100%</b> |

*Panel E: Distribution of single- and team-managed fund-month by fund size*

|              | Team-Managed   |            | Single-Managed |            | Total          | Percent     |
|--------------|----------------|------------|----------------|------------|----------------|-------------|
|              | Number         | Percent    | Number         | Percent    |                |             |
| 1 (Small)    | 46,053         | 55%        | 37,763         | 45%        | 83,816         | 21%         |
| 2            | 47,402         | 58%        | 34,022         | 42%        | 81,424         | 20%         |
| 3            | 47,797         | 60%        | 32,411         | 40%        | 80,208         | 20%         |
| 4            | 47,852         | 60%        | 32,176         | 40%        | 80,028         | 20%         |
| 5 (Large)    | 46,309         | 58%        | 34,036         | 42%        | 80,345         | 20%         |
| <b>Total</b> | <b>235,413</b> | <b>58%</b> | <b>170,408</b> | <b>42%</b> | <b>405,821</b> | <b>100%</b> |

*Panel F: Distribution of management team size*

|              | Total          | Percent     |
|--------------|----------------|-------------|
| 1            | 170,408        | 42%         |
| 2            | 113,808        | 28%         |
| 3            | 55,711         | 14%         |
| 4            | 28,347         | 7%          |
| 5            | 15,060         | 4%          |
| 6+           | 22,487         | 6%          |
| <b>Total</b> | <b>405,821</b> | <b>100%</b> |

**Table 2: Fund Characteristics of Team- and Single- Managed Funds**

Table 2 shows the summary statistics for manager-fund-month observations of in the sample. Panel A reports statistics for team-managed fund and Panel B reports statistics for single-managed funds. In Panel C, a difference in means test is performed between team- and single-managed funds. The variable *Fund Size* is the total net assets under management of the fund in millions of dollars; *Family Size* is the aggregated assets under management of all funds managed by a fund family complex in millions of dollars; *Fund Age* is the age of the fund, calculated as the number of years between the fund's oldest share class's inception date and a particular month end; *Turnover Ratio* measures the percentage of fund assets that are renewed, which is expressed as the minimum of the annual aggregated purchase or sale of securities as a percentage of total net assets. *Expense Ratio* measures fund operational costs as a percentage of fund total net assets, which includes management and marketing fees; *Fund Net Return* is a fund's total monthly return net of expense ratio; *Fund Alpha* is fund risk-adjusted returns over the preceding 12 months, estimated using the Carhart (1997) four-factor model; Volatility is the standard deviation of fund net returns over the preceding 12 months; *Fund Flow* is the measure of inflow or outflow of capital expressed as a percentage growth in total net assets; *Manager Experience* is fund managers' experience in the asset management industry, measured in years; *Manager Tenure* is the number of years the manager has been hired by a fund; *Fund Managed* is the number of simultaneously managed funds by a fund manager in a given month. \*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively.

| Variables                  | Team-Managed |          |           | Single-Managed |          |            | Team - Single |     |          |     |
|----------------------------|--------------|----------|-----------|----------------|----------|------------|---------------|-----|----------|-----|
|                            | Mean         | Median   | Std.      | Mean           | Median   | Std.       | Mean          |     | Median   |     |
| Fund Size (\$million)      | 1783.821     | 241.368  | 7839.832  | 1200.470       | 183.432  | 4349.846   | 583.352       | *** | 57.937   | *** |
| Family Size (\$million)    | 24323.005    | 6898.805 | 58913.205 | 41002.328      | 4459.783 | 101445.812 | -16679.322    | *** | 2439.022 | *** |
| Fund Age (years)           | 12.833       | 9.430    | 12.326    | 12.959         | 8.814    | 13.431     | -0.126        | *** | 0.616    | *** |
| Turnover Ratio (%)         | 75.370       | 60.000   | 62.014    | 88.255         | 63.000   | 82.731     | -12.885       | *** | -3.000   | *** |
| Expense Ratio (%)          | 1.174        | 1.135    | 0.409     | 1.275          | 1.220    | 0.465      | -0.101        | *** | -0.085   | *** |
| Fund Net Return (%)        | 0.700        | 1.160    | 4.875     | 0.728          | 1.119    | 5.009      | -0.028        | **  | 0.041    | *** |
| Fund Alpha (%)             | -0.054       | -0.057   | 0.596     | -0.057         | -0.066   | 0.715      | 0.004         | **  | 0.009    | *** |
| Volatility (%)             | 4.581        | 4.119    | 2.101     | 4.705          | 4.243    | 2.229      | -0.123        | *** | -0.124   | *** |
| Fund Flow (%)              | 0.601        | -0.165   | 5.961     | 0.864          | -0.074   | 6.372      | -0.263        | *** | -0.091   | *** |
| Manager Experience (years) | 8.002        | 6.507    | 6.290     | 8.558          | 6.926    | 6.614      | -0.556        | *** | -0.419   | *** |
| Manager Tenure (years)     | 4.878        | 3.500    | 4.589     | 5.733          | 4.083    | 5.378      | -0.855        | *** | -0.583   | *** |
| Funds Managed              | 3.927        | 3.000    | 4.064     | 2.738          | 2.000    | 3.162      | 1.189         | *** | 1.000    | *** |



**Table 3: Correlation Matrix**

This table displays the correlation between variables used the study:  $\ln(\text{Fund Size})$  is the natural logarithm of the total net assets under management of the fund in millions of dollars;  $\ln(\text{Family Size})$  is the natural logarithm of the aggregated assets under management of all funds managed by a fund family complex in millions of dollars;  $\ln(\text{Fund Age})$  is the natural logarithm of the age of the fund, calculated as the number of years between the fund's oldest share class's inception date and a particular month end; *Turnover Ratio* measures the percentage of fund assets that are renewed, which is expressed as the minimum of the annual aggregated purchase or sale of securities as a percentage of total net assets. *Expense Ratio* measures fund operational costs as a percentage of fund total net assets, which includes management and marketing fees; *Fund Net Return* is a fund's total monthly return net of expense ratio; *Fund Alpha* is fund risk-adjusted returns over the preceding 12 months, estimated using the Carhart (1997) four-factor model; *Volatility* is the standard deviation of fund net returns over the preceding 12 months; *Fund Flow* is the measure of inflow or outflow of capital expressed as a percentage growth in total net assets;  $\ln(\text{Mgr Experience})$  is the natural logarithm of fund managers' experience in the asset management industry, measured in years;  $\ln(\text{Mgr Tenure})$  is the natural logarithm of the number of years the manager has been hired by a fund; *Fund Managed* is the number of simultaneously managed funds by a fund manager in a given month.

|                                   | (1)          | (2)    | (3)    | (4)    | (5)    | (6)    | (7)    | (8)    | (9)    | (10)         | (11)   | (12)  |
|-----------------------------------|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------------|--------|-------|
| (1) $\ln(\text{Fund Size})$       | 1.000        |        |        |        |        |        |        |        |        |              |        |       |
| (2) $\ln(\text{Family Size})$     | <b>0.617</b> | 1.000  |        |        |        |        |        |        |        |              |        |       |
| (3) $\ln(\text{Fund Age})$        | 0.497        | 0.222  | 1.000  |        |        |        |        |        |        |              |        |       |
| (4) Turnover Ratio                | -0.185       | -0.058 | -0.139 | 1.000  |        |        |        |        |        |              |        |       |
| (5) Expense Ratio                 | -0.390       | -0.333 | -0.182 | 0.210  | 1.000  |        |        |        |        |              |        |       |
| (6) Fund Net Return               | 0.019        | 0.017  | 0.005  | -0.021 | -0.015 | 1.000  |        |        |        |              |        |       |
| (7) Fund Alpha                    | 0.045        | 0.050  | -0.039 | -0.077 | -0.063 | -0.017 | 1.000  |        |        |              |        |       |
| (8) Volatility                    | -0.088       | -0.041 | -0.061 | 0.192  | 0.149  | 0.029  | -0.084 | 1.000  |        |              |        |       |
| (9) Fund Flow                     | -0.062       | -0.027 | -0.190 | 0.003  | 0.005  | 0.050  | 0.152  | -0.006 | 1.000  |              |        |       |
| (10) $\ln(\text{Mgr Experience})$ | 0.109        | 0.055  | 0.195  | -0.101 | -0.043 | 0.001  | -0.015 | -0.020 | -0.045 | 1.000        |        |       |
| (11) $\ln(\text{Mgr Tenure})$     | 0.145        | -0.035 | 0.301  | -0.159 | -0.053 | 0.004  | -0.005 | -0.033 | -0.057 | <b>0.686</b> | 1.000  |       |
| (12) Funds Managed                | 0.107        | 0.219  | 0.005  | -0.046 | -0.156 | -0.001 | 0.002  | 0.003  | -0.022 | 0.116        | -0.031 | 1.000 |

**Table 4: Effect of Team Management on Fund Performance**

This table provides the OLS regression results of the effect of team management on a fund's performance (equation (2)). In columns (1) and (2), the dependent variable is *Fund Alpha*, fund risk-adjusted returns over the preceding 12 months, estimated using the Carhart (1997) four-factor model. In columns (3) and (4), the dependent variable is *Realised Alpha*, which is calculated as fund net return minus fund expected return (estimated using the fund four-factor betas and contemporaneous factor returns over the preceding 12 months). The independent variable of interest is *TEAM* in columns (1) and (3), which is an indicator that equals one if the fund has two (or more) managers listed and zero if the fund only has one fund manager at month ends. The independent variables of interest in columns (2) and (4) are *TEAM 2*, *TEAM 3* and *TEAM 4 +*, which are indicators that equal to one if the fund has two, three, or four or more managers at month ends. Other variables are defined in Section 4. *Fund Flow* over the preceding 12 months are controlled for in each regression. The first 12 months of observations after any changes in management members are removed. Time (year-month), fund, and manager fixed effects are included in each regression and standard errors are clustered at the fund level. *t*-statistics are reported in parentheses. \*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively.

|                       | (1)                   | (2)                   | (3)                    | (4)                    |
|-----------------------|-----------------------|-----------------------|------------------------|------------------------|
|                       | Fund Alpha            | Fund Alpha            | Realised Alpha         | Realised Alpha         |
| <i>TEAM</i>           | 0.0044<br>(0.34)      |                       | -0.0163<br>(-1.00)     |                        |
| <i>TEAM 2</i>         |                       | 0.0025<br>(0.18)      |                        | -0.0173<br>(-1.00)     |
| <i>TEAM 3</i>         |                       | 0.0152<br>(0.90)      |                        | -0.0165<br>(-0.76)     |
| <i>TEAM 4+</i>        |                       | -0.0009<br>(-0.05)    |                        | -0.0113<br>(-0.49)     |
| <i>ln(Fund Size)</i>  | -0.0376***<br>(-7.48) | -0.0375***<br>(-7.46) | -0.0855***<br>(-12.90) | -0.0856***<br>(-12.89) |
| <i>ln(Fund Age)</i>   | 0.0287**<br>(2.00)    | 0.0286**<br>(1.99)    | -0.0416**<br>(-2.19)   | -0.0416**<br>(-2.18)   |
| <i>Expense Ratio</i>  | -0.0595**<br>(-1.97)  | -0.0594**<br>(-1.96)  | -0.0385<br>(-1.00)     | -0.0386<br>(-1.01)     |
| <i>Turnover Ratio</i> | -0.0004***<br>(-3.29) | -0.0004***<br>(-3.29) | -0.0004***<br>(-2.67)  | -0.0004***<br>(-2.67)  |
| <i>Volatility</i>     | -0.0152***<br>(-3.19) | -0.0152***<br>(-3.19) | -0.0506***<br>(-8.10)  | -0.0506***<br>(-8.11)  |
| <i>ln(Mgr Tenure)</i> | -0.0265***<br>(-4.73) | -0.0264***<br>(-4.75) | -0.0204***<br>(-2.72)  | -0.0202***<br>(-2.71)  |
| <i>Multi Fund</i>     | -0.0440***<br>(-4.04) | -0.0441***<br>(-4.03) | -0.0391***<br>(-2.86)  | -0.0393***<br>(-2.87)  |
| <i>Const.</i>         | -0.0000<br>(-0.02)    | -0.0000<br>(-0.02)    | -0.0000<br>(-0.06)     | -0.0000<br>(-0.05)     |
| <b>Past Flow</b>      | Y                     | Y                     | Y                      | Y                      |
| <b>Year-Month FE</b>  | Y                     | Y                     | Y                      | Y                      |
| <b>Fund FE</b>        | Y                     | Y                     | Y                      | Y                      |
| <b>Manager FE</b>     | Y                     | Y                     | Y                      | Y                      |
| <b>Cluster (Fund)</b> | Y                     | Y                     | Y                      | Y                      |
| <b>Obs.</b>           | 651458                | 651458                | 651458                 | 651458                 |
| <b>R-sq</b>           | 0.2240                | 0.2240                | 0.1087                 | 0.1087                 |

**Table 5: Effect of Team Management on Fund Risk**

This table provides the OLS regression results of the effect of team management on a fund's risk (equation (3)). In columns (1) and (2), the dependent variable is *Volatility*, which is fund risk-adjusted returns over the preceding 12 months, estimated using the Carhart (1997) four-factor model. In columns (3) and (4), the dependent variable is *Return*<sup>2</sup>, which is fund net return squared. In columns (5) and (6), the dependent variable is the dependent variable is *Abs(Return)*, which is the absolute value of fund net return. The independent variable of interest is *TEAM* in columns (1), (3) and (5), which is an indicator that equals one if the fund has two (or more) managers listed and zero if the fund only has one fund manager at month ends. The independent variables of interest in columns (2), (4) and (6) are *TEAM 2*, *TEAM3* and *TEAM 4+*, which are indicators that equal to one if the fund has two, three, or four or more managers at month ends. Other variables are defined in Section 4. The first 12 months of observations after any changes in management members are removed. Time (year-month), fund, and manager fixed effects are included in each regression and standard errors are clustered at the fund level. *t*-statistics are reported in parentheses. \*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively.

|                       | (1)                   | (2)                   | (3)                   | (4)                   | (5)                   | (6)                   |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                       | Volatility            | Volatility            | Return <sup>2</sup>   | Return <sup>2</sup>   | Abs(Return)           | Abs(Return)           |
| <i>TEAM</i>           | -0.0032<br>(-0.10)    |                       | -0.2816<br>(-0.82)    |                       | -0.0324<br>(-1.27)    |                       |
| <i>TEAM 2</i>         |                       | -0.0159<br>(-0.48)    |                       | -0.4438<br>(-1.22)    |                       | -0.0377<br>(-1.42)    |
| <i>TEAM 3</i>         |                       | 0.0075<br>(0.18)      |                       | -0.2424<br>(-0.51)    |                       | -0.0451<br>(-1.32)    |
| <i>TEAM 4+</i>        |                       | 0.0376<br>(0.88)      |                       | 0.3662<br>(0.80)      |                       | 0.0062<br>(0.18)      |
| <i>ln(Fund Size)</i>  | 0.0749***<br>(5.84)   | 0.0743***<br>(5.79)   | 0.9787***<br>(6.29)   | 0.9691***<br>(6.23)   | 0.0630***<br>(5.54)   | 0.0625***<br>(5.48)   |
| <i>ln(Fund Age)</i>   | -0.1061***<br>(-3.23) | -0.1066***<br>(-3.25) | -1.6220***<br>(-4.26) | -1.6280***<br>(-4.27) | -0.1234***<br>(-4.48) | -0.1236***<br>(-4.48) |
| <i>Expense Ratio</i>  | -0.0103<br>(-0.17)    | -0.0108<br>(-0.18)    | -1.3018*<br>(-1.87)   | -1.3104*<br>(-1.88)   | -0.0637<br>(-1.20)    | -0.0643<br>(-1.21)    |
| <i>Turnover Ratio</i> | 0.0007**<br>(2.50)    | 0.0007**<br>(2.51)    | 0.0065*<br>(1.70)     | 0.0065*<br>(1.71)     | 0.0003<br>(1.17)      | 0.0003<br>(1.18)      |
| <i>ln(Mgr Tenure)</i> | -0.0299**<br>(-2.19)  | -0.0281**<br>(-2.07)  | -0.2973*<br>(-1.95)   | -0.2724*<br>(-1.78)   | -0.0234**<br>(-2.12)  | -0.0222**<br>(-2.01)  |
| <i>Multi Fund</i>     | -0.0008<br>(-0.03)    | -0.0021<br>(-0.08)    | -0.1394<br>(-0.51)    | -0.1575<br>(-0.57)    | -0.0153<br>(-0.74)    | -0.0161<br>(-0.78)    |
| <i>Const.</i>         | -0.0000<br>(-0.04)    | -0.0000<br>(-0.04)    | -0.0000<br>(-0.01)    | -0.0000<br>(-0.01)    | 0.0000<br>(0.26)      | 0.0000<br>(0.27)      |
| <b>Year-Month FE</b>  | Y                     | Y                     | Y                     | Y                     | Y                     | Y                     |
| <b>Fund FE</b>        | Y                     | Y                     | Y                     | Y                     | Y                     | Y                     |
| <b>Manager FE</b>     | Y                     | Y                     | Y                     | Y                     | Y                     | Y                     |
| <b>Cluster (Fund)</b> | Y                     | Y                     | Y                     | Y                     | Y                     | Y                     |
| <b>Obs.</b>           | 651458                | 651458                | 651458                | 651458                | 651458                | 651458                |
| <b>R-sq</b>           | 0.8058                | 0.8058                | 0.6570                | 0.6570                | 0.6708                | 0.6708                |

**Table 6: The Effect of Team Management and Fund Flow**

This table provides the OLS regression results of the effect of team management on fund flow (equation (4)). The dependent variable is *Fund Flow*, which is the measure of inflow or outflow of capital expressed as a percentage growth in total net assets. The independent variable of interest is *TEAM* in columns (1), which is an indicator that equals one if the fund has two (or more) managers listed and zero if the fund only has one fund manager at month ends. The independent variables of interest in columns (2) are *TEAM 2*, *TEAM3* and *TEAM 4 +*, which are indicators that equal to one if the fund has two, three, or four or more managers at month ends. Other variables are defined in Section 4. *Fund Flow* over the preceding 12 months are controlled for in each regression. The first 12 months of observations after any changes in management members are removed. Time (year-month), fund, and manager fixed effects are included in each regression and standard errors are clustered at the fund level. *t*-statistics are reported in parentheses. \*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively.

|                       | (1)                    | (2)                    |
|-----------------------|------------------------|------------------------|
|                       | Fund Flow              | Fund Flow              |
| <i>TEAM</i>           | -0.0407<br>(-1.05)     |                        |
| <i>TEAM 2</i>         |                        | -0.0074<br>(-0.18)     |
| <i>TEAM 3</i>         |                        | -0.0619<br>(-1.14)     |
| <i>TEAM 4+</i>        |                        | -0.1427**<br>(-2.47)   |
| <i>ln(Fund Size)</i>  | -0.0722***<br>(-2.97)  | -0.0702***<br>(-2.88)  |
| <i>ln(Fund Age)</i>   | -1.2344***<br>(-17.20) | -1.2361***<br>(-17.21) |
| <i>Expense Ratio</i>  | -0.3977***<br>(-3.74)  | -0.3961***<br>(-3.73)  |
| <i>Turnover Ratio</i> | -0.0007*<br>(-1.92)    | -0.0008**<br>(-1.97)   |
| <i>Obj. Flow</i>      | 0.5433***<br>(22.37)   | 0.5429***<br>(22.36)   |
| <i>Volatility</i>     | -0.0566***<br>(-3.80)  | -0.0564***<br>(-3.79)  |
| <i>Fund Alpha</i>     | 0.7456***<br>(32.03)   | 0.7456***<br>(32.04)   |
| <i>ln(Mgr Tenure)</i> | -0.0044<br>(-0.33)     | -0.0065<br>(-0.48)     |
| <i>Multi Fund</i>     | -0.0674*<br>(-1.87)    | -0.0634*<br>(-1.76)    |
| <i>Const.</i>         | 0.0000<br>(0.03)       | 0.0000<br>(0.04)       |
| <b>Past Flow</b>      | Y                      | Y                      |
| <b>Year-Month FE</b>  | Y                      | Y                      |
| <b>Fund FE</b>        | Y                      | Y                      |
| <b>Manager FE</b>     | Y                      | Y                      |
| <b>Cluster (Fund)</b> | Y                      | Y                      |
| <b>Obs.</b>           | 927495                 | 927495                 |
| <b>R-sq</b>           | 0.1815                 | 0.1815                 |

**Table 7: Change in Fund Flow Surrounding Management Structure Changes**

This table provides the OLS regression results of the management structure changes on fund flow. The dependent variable is Fund Flow, which is the measure of inflow or outflow of capital expressed as a percentage growth in total net assets. SINGLE to TEAM (TEAM to SINGLE) is an indicator variable that equals one if during the month the fund's management structure has changed from single to team management (team to single managed). Other variables controlled for are the same as regressions in Table 6 and defined in Section 4. Fund Flow over the preceding 12 months are controlled for in each regression. Time (year-month), fund, and manager fixed effects are included in each regression and standard errors are clustered at the fund level. *t*-statistics are reported in parentheses. \*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively.

|                           | (1)                   |                           | (2)                   |
|---------------------------|-----------------------|---------------------------|-----------------------|
|                           | Fund Flow             |                           | Fund Flow             |
| <i>SINGLE to TEAM t-6</i> | 0.0433<br>(0.26)      | <i>TEAM to SINGLE t-6</i> | 0.0056<br>(0.02)      |
| <i>SINGLE to TEAM t-5</i> | 0.0151<br>(0.08)      | <i>TEAM to SINGLE t-5</i> | -0.1343<br>(-0.49)    |
| <i>SINGLE to TEAM t-4</i> | -0.0825<br>(-0.47)    | <i>TEAM to SINGLE t-4</i> | -0.4706***<br>(-2.63) |
| <i>SINGLE to TEAM t-3</i> | -0.0779<br>(-0.44)    | <i>TEAM to SINGLE t-3</i> | -0.3859*<br>(-1.81)   |
| <i>SINGLE to TEAM t-2</i> | -0.0029<br>(-0.02)    | <i>TEAM to SINGLE t-2</i> | -0.1974<br>(-0.66)    |
| <i>SINGLE to TEAM t-1</i> | 0.0364<br>(0.17)      | <i>TEAM to SINGLE t-1</i> | -0.3246<br>(-1.42)    |
| <i>SINGLE to TEAM</i>     | -0.4266***<br>(-2.73) | <i>TEAM to SINGLE</i>     | 0.1646<br>(0.66)      |
| <i>SINGLE to TEAM t+1</i> | -0.2576<br>(-1.53)    | <i>TEAM to SINGLE t+1</i> | -0.3552***<br>(-2.01) |
| <i>SINGLE to TEAM t+2</i> | -0.1719<br>(-1.12)    | <i>TEAM to SINGLE t+2</i> | -0.2979*<br>(-1.72)   |
| <i>SINGLE to TEAM t+3</i> | 0.1303<br>(0.75)      | <i>TEAM to SINGLE t+3</i> | -0.0719<br>(-0.29)    |
| <i>SINGLE to TEAM t+4</i> | 0.1019<br>(0.60)      | <i>TEAM to SINGLE t+4</i> | 0.3188<br>(1.42)      |
| <i>SINGLE to TEAM t+5</i> | 0.1559<br>(0.94)      | <i>TEAM to SINGLE t+5</i> | 0.1063<br>(0.52)      |
| <i>SINGLE to TEAM t+6</i> | -0.2455<br>(-1.63)    | <i>TEAM to SINGLE t+6</i> | 0.0133<br>(0.06)      |
| <b>Const.</b>             | Y                     | <b>Const.</b>             | Y                     |
| <b>Fund Controls</b>      | Y                     | <b>Fund Controls</b>      | Y                     |
| <b>Manager Controls</b>   | Y                     | <b>Manager Controls</b>   | Y                     |
| <b>Past Flow</b>          | Y                     | <b>Past Flow</b>          | Y                     |
| <b>Year-Month FE</b>      | Y                     | <b>Year-Month FE</b>      | Y                     |
| <b>Fund FE</b>            | Y                     | <b>Fund FE</b>            | Y                     |
| <b>Manager FE</b>         | Y                     | <b>Manager FE</b>         | Y                     |
| <b>Cluster (Fund)</b>     | Y                     | <b>Cluster (Fund)</b>     | Y                     |
| <b>Obs.</b>               | 927495                | <b>Obs.</b>               | 927495                |
| <b>R-sq</b>               | 0.1815                | <b>R-sq</b>               | 0.1815                |

**Table 8: Team Management and Fund Performance - Flow Relationship**

This table provides the OLS regression results of the effect of team management on fund performance and flow relationship. The dependent variable is *Fund Flow*, which is the measure of inflow or outflow of capital expressed as a percentage growth in total net assets. The independent variables of interest are *TEAM*, which is an indicator that equals one if the fund has two (or more) managers listed and zero if the fund only has one fund manager at month ends, and interaction terms of *TEAM* with other performance related variables. Based on *Fund Alpha*, in each month each fund is divided into five quintiles. *INDMID* equals to one for funds that belong in the three middle performance quintile and zero otherwise. *INDHIGH* equals to one for funds that belong in the highest quintile or zero otherwise. In Columns (3) and (4), piecewise linear specifications are used. For each month, a performance rank (*PerfRank*) is assigned to each fund in the same investment style category base *Fund Alpha*. *LOW* is defined as  $\min(\text{PerfRank}, 0.2)$ , *MID* is defined as  $\min(\text{PerfRank} - \text{LOW}, 0.6)$ , and *HIGH* is defined as  $\text{PerfRank} - \text{MID} - \text{LOW}$ . Other variables controlled for are the same as regressions in Table 6 (excluding *Fund Alpha*) and defined in Section 4. Fund Flow over the preceding 12 months are controlled for in each regression. Time (year-month), fund, and manager fixed effects are included in each regression and standard errors are clustered at the fund level. *t*-statistics are reported in parentheses. \*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively.

|                         | (1)                    | (2)                    | (3)                    | (4)                    |
|-------------------------|------------------------|------------------------|------------------------|------------------------|
|                         | Fund Flow              | Fund Flow              | Fund Flow              | Fund Flow              |
| <i>TEAM</i>             | -0.043<br>(-1.10)      | 0.081<br>(1.47)        | -0.0437<br>(-1.12)     | 0.0466<br>(0.51)       |
| <i>INDMID</i>           | 0.4532***<br>-16.36    | 0.5498***<br>(14.49)   |                        |                        |
| <i>INDHIGH</i>          | 1.2133***<br>-29.81    | 1.4100***<br>(23.61)   |                        |                        |
| <i>INDMID * TEAM</i>    |                        | -0.1225**<br>(-2.45)   |                        |                        |
| <i>INDHIGH * TEAM</i>   |                        | -0.2469***<br>(-3.14)  |                        |                        |
| <i>LOW</i>              |                        |                        | 2.4033***<br>-8.5      | 2.6855***<br>(7.04)    |
| <i>MID</i>              |                        |                        | 0.8691***<br>-13.5     | 0.8405***<br>(9.62)    |
| <i>HIGH</i>             |                        |                        | 5.6856***<br>-16.55    | 6.8326***<br>(13.41)   |
| <i>LOW * TEAM</i>       |                        |                        |                        | -0.3847<br>(-0.75)     |
| <i>MID * TEAM</i>       |                        |                        |                        | 0.0371<br>(0.32)       |
| <i>HIGH * TEAM</i>      |                        |                        |                        | -1.4498**<br>(-2.17)   |
| $\ln(\text{Fund Size})$ | -0.0773***<br>(-3.24)  | -0.0772***<br>(-3.23)  | -0.0687***<br>(-2.86)  | -0.0685***<br>(-2.85)  |
| $\ln(\text{Fund Age})$  | -1.2296***<br>(-17.17) | -1.2295***<br>(-17.16) | -1.2287***<br>(-17.13) | -1.2292***<br>(-17.12) |
| <i>Expense Ratio</i>    | -0.4082***<br>(-3.83)  | -0.4095***<br>(-3.84)  | -0.3935***<br>(-3.67)  | -0.3963***<br>(-3.69)  |
| <i>Turnover Ratio</i>   | -0.0008**<br>(-2.17)   | -0.0008**<br>(-2.17)   | -0.0008**<br>(-1.97)   | -0.0008**<br>(-1.98)   |
| <i>Obj. Flow</i>        | 0.5903***              | 0.5903***              | 0.5943***              | 0.5944***              |

|                       |            |            |            |            |
|-----------------------|------------|------------|------------|------------|
|                       | (24.05)    | (24.04)    | -24.24     | -24.23     |
| <i>Volatility</i>     | -0.0494*** | -0.0500*** | -0.0429*** | -0.0436*** |
|                       | (-3.33)    | (-3.37)    | (-2.87)    | (-2.93)    |
| <i>ln(Mgr Tenure)</i> | -0.0028    | -0.0033    | -0.0017    | -0.002     |
|                       | (-0.21)    | (-0.25)    | (-0.13)    | (-0.15)    |
| <i>Multi Fund</i>     | -0.0781**  | -0.0785**  | -0.0716**  | -0.0718**  |
|                       | (-2.17)    | (-2.18)    | (-1.99)    | (-1.99)    |
| <i>Const.</i>         | 0.0000     | 0.0000     | 0.0000     | 0.0000     |
|                       | (0.03)     | (0.03)     | (0.08)     | (0.07)     |
| <b>Past Flow</b>      | Y          | Y          | Y          | Y          |
| <b>Year-Month FE</b>  | Y          | Y          | Y          | Y          |
| <b>Fund FE</b>        | Y          | Y          | Y          | Y          |
| <b>Manager FE</b>     | Y          | Y          | Y          | Y          |
| <b>Cluster (Fund)</b> | Y          | Y          | Y          | Y          |
| <b>Obs.</b>           | 927495     | 927495     | 927495     | 927495     |
| <b>R-sq</b>           | 0.1808     | 0.1808     | 0.1822     | 0.1822     |

**Table 9 Statistical Power of Team Management Performance Effect Analysis**

This table shows the analyses of the statistical power of the following model (equation (2)) to detect the effect of team management on fund performance:

$$\text{Fund Alpha}_{i,j,t-12:t-1} = \beta_0 + \beta_1 \text{TEAM}_{j,t} + \beta_2 \ln(\text{Fund Size})_{j,t} + \beta_3 \ln(\text{Fund Age})_{j,t} + \beta_4 \text{Expenses}_{j,t} + \beta_5 \text{Turnover}_{j,t} + \beta_6 \text{Volatility}_{j,t-12:t-1} + \beta_7 \ln(\text{Mgr Tenure})_{i,j,t} + \beta_8 \text{Multi Fund}_{i,t} + \sum_{m=t-12}^{t-1} \beta_m \text{Fund Flow}_{j,m} + \theta_i + \phi_j + \mu_t + \epsilon_{j,t}$$

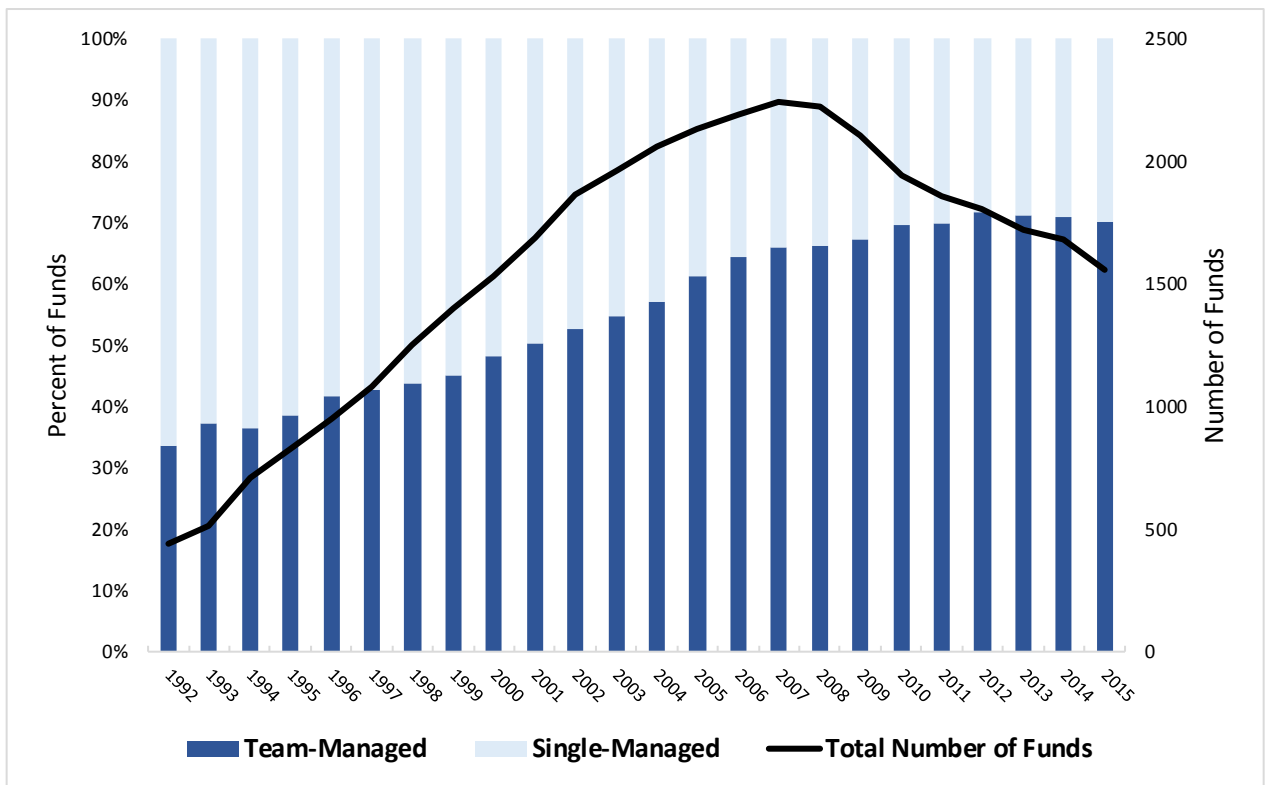
The independent variable of interest is *TEAM*, which is an indicator that equals one if the fund has two (or more) managers listed and zero if the fund only has one fund manager at month ends. In columns (1), the dependent variable is *Fund Alpha*, which is fund risk-adjusted returns over the preceding 12 months, estimated using the Carhart (1997) four-factor model (corresponds to Table 4 Column (1)). In columns (2) to (9), the dependent variable is *Simulated Fund Alpha* using the equation:

$$\text{Simulated Fund Alpha}_{j,t} = \bar{\alpha}_j + k * \text{TEAM}_{j,t} + \epsilon_{j,t}, \epsilon_{j,t} \sim N(0, \sigma_j^2)$$

where  $\bar{\alpha}_j$  is the mean *Fund Alpha* of fund *j*, *k* is a constant that reflect the team management effect, and  $\sigma_j^2$  is the standard deviation of *Fund Alpha* for fund *j*. Other variables controlled for are the same as regression in Table 4 and are defined in Section 4. *Fund Flow* over the preceding 12 months are controlled for in each regression. Time (year-month), fund, and manager fixed effects are included in each regression and standard errors are clustered at the fund level. *t*-statistics are reported in parentheses. \*, \*\* and \*\*\* denote significance at the 10%, 5% and 1% levels, respectively.

|                         | (1)              | (2)                  | (3)                  | (4)                | (5)                 | (6)                 | (7)                 | (8)                | (9)              |
|-------------------------|------------------|----------------------|----------------------|--------------------|---------------------|---------------------|---------------------|--------------------|------------------|
|                         | Fund Alpha       | Simulated Fund Alpha |                      |                    |                     |                     |                     |                    |                  |
|                         |                  | K = 0                | K = 0.1%             | K = 0.05%          | K = 0.03%           | K = 0.02%           | K = 0.01%           | K = 0.005%         | K = 0.001%       |
| TEAM                    | 0.0044<br>(0.34) | 0.0066<br>(1.34)     | 0.1066***<br>(21.58) | 0.0116**<br>(2.35) | 0.0266***<br>(5.39) | 0.0266***<br>(5.39) | 0.0166***<br>(3.36) | 0.0116**<br>(2.35) | 0.0076<br>(1.54) |
| <b>Const.</b>           | Y                | Y                    | Y                    | Y                  | Y                   | Y                   | Y                   | Y                  | Y                |
| <b>Fund Controls</b>    | Y                | Y                    | Y                    | Y                  | Y                   | Y                   | Y                   | Y                  | Y                |
| <b>Manager Controls</b> | Y                | Y                    | Y                    | Y                  | Y                   | Y                   | Y                   | Y                  | Y                |
| <b>Past Flow</b>        | Y                | Y                    | Y                    | Y                  | Y                   | Y                   | Y                   | Y                  | Y                |
| <b>Year-Month FE</b>    | Y                | Y                    | Y                    | Y                  | Y                   | Y                   | Y                   | Y                  | Y                |
| <b>Fund FE</b>          | Y                | Y                    | Y                    | Y                  | Y                   | Y                   | Y                   | Y                  | Y                |
| <b>Manager FE</b>       | Y                | Y                    | Y                    | Y                  | Y                   | Y                   | Y                   | Y                  | Y                |
| <b>Cluster (Fund)</b>   | Y                | Y                    | Y                    | Y                  | Y                   | Y                   | Y                   | Y                  | Y                |
| <b>Obs.</b>             | 651458           | 651458               | 651458               | 651458             | 651458              | 651458              | 651458              | 651458             | 651458           |
| <b>R-sq</b>             | 0.2236           | 0.0412               | 0.0423               | 0.0414             | 0.0413              | 0.0412              | 0.0412              | 0.0412             | 0.0412           |





**Figure 1. Change of Mutual Fund Management Structures from 1992 to 2015**

This figure shows the percentage of single- and team-managed funds as well as the total number of funds in each year of the sample period in this study. Fund management information is obtained from Morningstar Direct. For funds that changed management structure during the year, the management structure of these funds are determined by the latest monthly observation within the year. The left-hand side vertical axis shows the percentage of funds that are managed by a single manager or a team of managers in the total number of funds in each sample year. The right-hand side vertical axis shows the total number of funds in each sample year. The horizontal axis shows the years included in the sample.

## **Appendix A: The Construction of Manager Data**

In this section, I highlight the main differences between reported managerial information in the CRSP and Morningstar databases. I also provide the details of the construction of the time-series data on manager-fund pairs used in this study.

In the CRSP database, the manager's full name is usually reported if an individual manager manages a fund. If there is more than one fund manager listed in the prospectus, CRSP has several ways of reporting. The most common entries are phrases such as "Team-managed", "Multiple Managers", or "Investment Committee" without any manager names. For some management teams, CRSP also reports a manager name with the addendum "et al." or "and team". A third category is when only the last names of managers are recorded (rarely more than three managers), separated by forward slashes. CRSP also reports the date when current management took control of the fund. However, in the case where multiple manager names are listed, it is unclear when each manager joined the fund. Given that it is not possible to accurately identify the individual managers and the start dates of their tenures in the CRSP database, movements of fund managers cannot be reliably tracked.

In response to the mutual fund 2003 scandal, the SEC promulgated a rule in October 2004, which requires the funds to disclose the names, title and other information of the members of the portfolio manager groups (Securities and Exchange Commission, 2004). After the new requirement has been established, Morningstar has retrospectively updated its entire database based on additional fund disclosures. Similar to CRSP, Morningstar also occasionally reports "team managed", "multiple managers", or the name of the investment company instead of disclosing the names of the members of the teams. However, the proportion of funds with blank or anonymous manager information is only 1.45% in the initial data sample (59 funds). This contributes to the low rate of funds with missing

management information. Note that by matching Morningstar manager records to the CRSP database, it is possible to identify the managers listed in a fund even when CRSP reports the fund as anonymously managed before 2004. This shows that Morningstar has successfully backfilled manager records of funds that previously did not report manager names.

Patel and Sarkissian (2014) systematically compare the three most common sources of managerial information (the CRSP database, Morningstar Principia and Morningstar Direct). In particular, Patel and Sarkissian (2014) evaluate the discrepancies in reported management structure in CRSP, Morningstar Principia (A CD-ROM based database, also offered by Morningstar Inc.) and Morningstar Direct by constructing a three-way matched sample across the three databases and comparing the manager information reported in each of the databases against actual SEC records for a random sample of 100 funds. The authors find that the accuracy of the number of team members and manager names reported in Morningstar Direct were 96% and 85% respectively, whereas it is 77% and 66% for CRSP, and 83% and 64% for Morningstar Principia. Since Morningstar is also considered to be a more important source to mutual fund investors than the CRSP database, it is the appropriate data source in investigating the effects of mutual fund management structure on investor demand. They also document large differences between reported team management incidences. This highlights one of the possible causes of the mixed findings provided in past literature (Patel and Sarkissian, 2014).

Although the sample used in my study begins from 1992, Morningstar Direct reports fund manager information from earlier years. The earliest manager record in the Morningstar database is Paul Cabot of the State Street Investment Trust, starting on 29<sup>th</sup> July 1924 to 1<sup>st</sup> January 1962. However, according to the Investment Company Institute, the SEC did not require mutual funds to disclose fund manager information in fund prospectuses before 1988. As a result, it is possible that some managers were not

documented before the disclosure was made mandatory (Ding and Wermers, 2012). In addition, most funds only disclosed total net assets values (and sometimes net returns) on a quarterly basis. As the estimation of the four-factor fund alpha requires at least 12 continuous monthly fund return and total net assets observations, observations before 1992 were removed as only a few funds reported fund information on a monthly basis in the early 1990s

Morningstar reports the first name, middle names, last names and the suffix (e.g. III or Jr.) of managers where applicable. In the sample, there are fund managers with the same first name-last name combination but who can be distinguished from each other using their middle name or suffix. I check with the biography of the fund manager provided in Morningstar Direct to determine that the names belong to different individuals when they are similar.

Spot checks against SEC mutual fund documentation indicate that Morningstar reports start dates and end dates of mutual fund manager tenures based on the filing date of the documents containing fund managerial or managerial changes (e.g., Form 497, Form 485BPOS). Morningstar also reports service start dates reported in the fund prospectus, which usually indicates the starting year and month. To ensure that the manager worked at the fund for the entire month, I set the start dates of manager tenures as the first day of the next month if the start date is not on the first day of a month. Similarly, I set the end date of a manager's tenure as the last day of the previous month if the last date is not the last day a month.

## **Appendix B: The AKM Approach**

To control for unobservable fund and manager heterogeneities in the analyses, I also apply the method developed by Abowd, Kramarz, & Margolis (1999) (referred to as the AKM method). The following sections first discuss the AKM method in details, then describe the construction of connected groups that are used to estimate fund manager fixed effects. Having estimated the manager fixed effects, the final section addresses a subsequent question of whether manager fixed effects differs between team- and single-managers.

### **B.1 The AKM Method of Controlling for Unobservable Manager Heterogeneities**

The advantage of the AKM method is that it allows manager and fund fixed effects to be separately identified through the use of connected groups. The method can be used to separate fund and manager fixed effects for both fund managers that have moved between different funds and managers that stayed within a single fund throughout the sample period, as long as the managers who stayed within a single fund have worked with other fund managers who have moved across different funds.

Within every group formed, all fund managers and firms are connected through fund managers who have managed more than one fund during their career. Any two fund managers are connected if they have ever worked in the same fund, whereas any two funds are connected if a fund manager moves from one fund to the other. For example, if manager 1 and manager 2 both worked in fund A, then manager 1 and manager 2 are connected. If manager 2 moved from fund A to fund B, then fund A and B are connected as a result of the movement of manager 2. Other fund managers who have been employed by fund B are all part of the connected group, even if the other managers in fund B have never left the fund.

As shown in the example above, a fund manager who has never been employed by more than one fund can still be connected to the group as long as the fund he or she worked at some stage employed at least one other fund manager who has moved between funds. Therefore, although there is only a small portion of managers that have ever been employed by more than one fund, the limited manager turnover can still generate enough movements to produce a fairly large connected sample that allows a large number of manager and fund fixed effects to be separately estimated through group connection. To separately identify the manager and fund fixed effects, connectedness is necessary and sufficient. Mobility, on the other hand, is sufficient but not a necessary condition (Graham, Li, and Qiu, 2012). The detailed proof can be found in Abowd et al., (1999) and Abowd, Creecy, and Kramarz, (2002).

## **B.2 Connected Group Construction**

Given that there are fund managers who have been employed by more than one fund in my sample, graph theory can be used to determine groups of connected fund managers and funds (Abowd et al., 2002). To identify groups of funds and fund managers that are connected, I take the following steps:

1. Based on manager history records of all funds in the sample, I obtain all unique combinations of fund managers and funds that employed these managers.
2. Start a group by selecting an arbitrary fund manager, update the connected group by adding all the mutual funds for which the manager ever worked based on the manager-fund combinations.
3. Next, add all fund managers who have ever worked in any of those funds contained in the updated group.
4. Continue adding all mutual funds for which any of these managers has ever worked and all individual fund managers who have ever worked in any of these funds to the

connected group. Repeat the process until no additional fund manager or additional fund can be added to the current group.

5. Start a new group by selecting an individual fund manager who has not been allocated to any group. Repeat the process for the next group until all combinations of manager and funds are depleted.

As a result of the group allocation process, every fund manager and every fund will be assigned to one and only one group. Each connected group contains all the managers who have ever worked for any of the funds in the group and all the funds at which any of the managers in the group were ever employed. In contrast, when a fund manager or fund is not connected to a group, then no fund in that group has ever employed that manager, nor has the fund hired any fund manager from the connected group. Note the size of the connected groups varies based on the mobility of the managers in the sample. Therefore, it is possible for a group to contain only one manager and one fund if the individual fund manager has never worked for any other funds and the fund has never employed any other fund manager.

In total, there are 497 connected groups in the full sample (for the description of the full sample, see Section 3.6), where the largest connected group consists of 2,859 individual funds, 5,076 fund managers and 793,873 manager-fund-months. If the first 12 months after any changes in fund management members are removed for the fund alpha and volatility analyses, the largest connected group consists of 2,826 funds, 4,883 managers and 536,000 fund month. The second largest group contains 12 funds, 22 fund managers, and 3,976 manager-fund-months observations. Using the largest connected group of managers and funds, I extract all corresponding 793,873 manager-fund-month observations. I refer to the sample developed based on the largest manager-fund connected group as the *connected sample* in contrast to the *full sample* for which the separate identification of every manager/fund fixed effects cannot be obtained.

In untabulated analyses, I test the multiple regression models in the study using the connected sample where all fund and manager fixed effects included in the sample can be estimated. I find the empirical results on the main variables of interest do not change. Overall, the results suggest that the conclusions made in this study are unaffected by inseparable fund and manager fixed effects.



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