Does Team Management Reduce Operational Risk? Evidence from the Financial Services Industry*

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Operational Risk Management and Team-Managed Funds

Abstract

Managing operational risk is one of the most important tasks of the risk management of modern financial institutions. Nevertheless, empirical research on operational risk is scarce. The reason for this is that operational risk is difficult to capture empirically and specific operational risk management decisions are typically not observable. Our paper attempts to overcome these shortcomings and to inform the debate on operational risk management by looking at the mutual fund industry. Data from mutual funds allow direct insight into both the performance and profit impact of certain decisions the fund company makes. We focus on the decision to employ a team instead of a solo manager to manage a specific fund. Our paper is the first to provide evidence that this might help to reduce the probability of misconduct of fund managers and, consequently, to reduce operational risk. We find that teams behave more in line with investors' interests than solo managers along several dimensions: Their investment styles are more reliable, they engage less in tournament behavior, and their performance is more stable over time. The costs of this form of operational risk management seem small. The risk-adjusted net-returns of team-managed funds are only slightly lower than those of solo-managed funds. Furthermore, investors seem to value the higher reliability associated with team management as evidenced by team-managed funds attracting significantly more new cash-flows. As fund managers typically charge a percentage fee based on assets under management, our study thus provides empirical evidence that managing operational risks can even result in a positive net-benefit for financial service firms.

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1. Introduction

The causes of the current financial crisis of 2007/08 have not been fully understood as of now. However, it is likely that human error and misconduct played some role in this crisis and many previous (financial as well as other) crises: There might be, for example, human error in terms of correctly assessing the risks associated with financial innovations, people might act carelessly because they are too greedy, or there might be misconduct in terms of not fully disclosing the risks of financial contracts to clients. Thus, it is not surprising that human error and misconduct have been identified as important components of operational risk.

The Basel Committee defines *operational risk* as "the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events" (Basel Committee, 2003, p.2). Its importance is highlighted by the fact that Basel II identifies operational risk as one of the main sources of risks financial institutions face. With its definition of operational risk given above, the Basel Committee (2003) has provided a framework for assessing operational risks in financial services firms. However, it still leaves the specific identification of operational risk management decisions and their consequences as a challenge. Empirical research has yet to inform the Committee's guidance.

This paper strives to inform the debate on the management of operational risks. Specifically, we argue that employing teams rather than individuals to solve certain tasks can be an effective mechanism to manage and eventually reduce operational risk. The rationale behind this argument is that the mutual monitoring of the members within a team helps them to correct each others errors and to prevent misconduct and problematic behaviour. For example, careless or risky behaviour of individual team members not be tolerated by the other members in a team.[1]

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[1] This view is opposed by goupthink theory that suggests that groups tend to isolate themselves and are not approachable for outside critique (Janis, 1972). According to this theory, employing teams might actually

We test whether employing teams helps to reduce operational risk using data from the mutual fund industry. Relying on the Basel Committee (2002) operational risk framework, we focus on the class of operational risks that relates to clients, products, and business practices. In particular, this classification addresses losses "arising from unintentional or negligent failure to meet a professional obligation to specific clients." This has direct consequences for the mutual fund industry, where managers are obliged to act in the best interest of their investors. We examine whether employing teams rather than solo managers helps to fulfil this obligation.

There are several aspects of managerial behavior that can be problematic from a fund investor's point of view -- and according to which teams and solo managers might differ. First, there is evidence that fund managers often deviate from the investment styles stated in their prospectus (Kim, Shukla, and Tomas, 2000). Furthermore, Brown and Harlow (2002) show that the style of many funds fluctuates significantly over time. This is a problem for investors who rely on a fund's past investment style as a predictor for its future investment style, because they might end up with a fund that does not fit into their overall portfolio. Additionally, funds with fluctuating styles also tend to underperform funds with more stable styles (Brown and Harlow, 2002). Second, many fund managers adjust risk in a tournament-like competition (Brown, Harlow, and Starks, 1996; Chevalier and Ellison, 1999; Kempf and Ruenzi, 2008; Kempf, Ruenzi, and Thiele, 2009). They do so to achieve a top position by the end of the year in order to receive higher expected inflows and eventually a higher compensation. However, such behavior might also lead to a bottom position by the end of the year. It is not in the best interest of clients as it is not aimed at finding an optimal portfolio from the investors' point of view. Huang, Sialm, and Zhang (2008) show that tournament behavior on average even has a negative impact on fund performance.

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increase rather than decrease operational risk. As our results provide no support for this alternative story, we do not elaborate on this theory.

Third, mutual fund investors are typically long-term investors that prefer a stable and predictable performance over time, as this facilitates financial planning. However, there is only very little persistence in performance (see, e.g., Carhart, 1997). While some funds do well in a specific year, they might not do very well in the next year.

To examine whether teams help to overcome some of these problems, we analyse differences in style drift, tournament behavior and performance persistence between team and solo managed US equity mutual funds in the period 1994 to 2003. Our paper is the first to assess the impact of a specific operational risk management decision on different aspects of managerial outcomes relevant for clients in a large sample drawn from the mutual fund industry. We can take advantage of detailed management and performance data to directly identify and measure the impact of operational risk management.[2] The mutual fund industry provides an ideal empirical test setting in this context for several reasons: First, our data come from a real-world professional business setting. Second, management structures are easily observable and we can directly compare the behavior of funds managed by teams and solo managers that are otherwise similar. Third, the decisions of fund managers are directly reflected in the returns of the funds managed and therefore easily observable. Fourth, the mutual fund industry allows us to run tests based on a large numbers of fund managers from different firms. Thus, our results will not be driven by the priming effects of the organizational culture of a specific firm.

Analyzing the styles of teams and solo managers we find that teams exhibit less style drift than solo-managed funds, i.e. they follow more stable and consistent styles over time. Furthermore, team-managed funds also engage less in tournament behavior. These behavioral differences are also reflected in differences in the performance of teams and solo managers: the former are

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[2] This helps us to overcome several of the typical problems empirical studies of operational risk according to Wei (2007) often face.

significantly more persistent in their performance than the latter. These results show for the first time that team management can indeed prevent problematic behavior of fund managers and thus help to reduce operational risk. This suggests that the decision to employ a team or a solo manager can indeed be interpreted as an operational risk management decision.

In the next step we examine whether reducing operational risk by employing teams is costly in terms of lower performance. This could be the case if team members free-ride on the effort of the other team members (Holmstrom, 1982). We do indeed find some evidence that the decision to employ teams leads to a negative impact on fund performance. However, the effect is relatively moderate.[3]

Along with measuring the performance impact of the team management decision, our data also allows us to examine the payoffs for those making the decision, i.e. the fund management company. Despite the empirical observation that performance in team-managed funds is slightly less than that of solo-managed funds, the former attract larger amounts of new cash flows from investors. Investors seem to prefer team-managed funds. Since mutual funds sponsors are typically paid a percentage of assets under management for services, the decision to choose teams (and thereby reduce operational risks) might well even have a net benefit for sponsors. Overall, these results provide evidence that operational risk management decisions can be both identified and valued.

Our paper contributes to two strands of the literature. First, it contributes to the emerging but still small empirical literature on operational risk. Allen and Balli (2004) find that returns still exhibit a large degree of idiosnycracy even after controlling for the impact of the typical Carhart (1997) risk factors as well as other traditional risks like market, credit, interest rate and exchange

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[3] This confirms results from existing studies like Chen, Hong, Huang, and Kubik (2004) and Bär, Kempf, and Ruenzi (2008).

rate risk. They interpret this remaining idiosyncratic risk as operational risk. However, they make no attempt at identifying the specific sources of those risks or how they could me mitigated. Cummins, Lewis, and Wei (2006) study the market reaction to large operational losses, and find them to be larger than the actual operational loss itself. Similar results are provided in Wei (2003) and (2006). However, none of those studies identifies a class of management decisions that are made with the goal of addressing operational risk. Reflecting the challenge of both specifically identifying and pricing risk management activities, Dionne et al. (2007) derive a shadow price for these services and find that they increase the efficiency of insurer operations. Second, our paper contributes to the empirical literature on team vs. solo management in the mutual fund industry. This literature has mainly focused on performance differences (see, e.g., Prather and Middleton, 2002 and 2006, Chen, Hong, Huang, and Kubik, 2004) as well as differences with respect to extremeness of investment styles (Bär, Kempf, and Ruenzi, 2008) and risk taking behaviour (Qiu, 2003, and Kempf and Ruenzi, 2008). None of these studies addresses team management against the background of operational risk.

The remainder of this paper is as follows. Section 2 describes the data. Section 3 provides results on differences in management outcomes, while Section 4 analysis consequences of those differences for performance and inflows. Section 5 examines the risk management implications of the findings and Section 6 concludes.

2. Data

Our primary data source is the CRSP Survivor Bias Free Mutual Fund Database.[4] This database covers U.S. open-end mutual funds and provides information about fund returns, fund management structures, total net assets, investment objectives, and other fund characteristics. We focus on actively managed equity funds which invest more than 50 % of their assets in stocks, excluding bond, money market and index funds. We use the ICDI objective codes, identified by Standard & Poor's Fund Services to define the market segments in which funds operate. This leaves us with 10 different segments.

We aggregate multiple classes of the same fund to avoid multiple counting. Although multiple share classes are listed as separate funds in CRSP, they are backed by the same portfolio of assets and have the same portfolio manager(s). Following the approach in Daniel, Grinblatt, Titman, and Wermers (1997), we identify classes by matching fund names and characteristics, such as fund management structure, turnover, and fund holdings in asset classes.

To examine the consequences of specific management structures, it is crucial to clearly classify a fund's management structure. CRSP reports management structures in several ways. First, for funds managed by an individual, the manager is reported by name. We classify these as "solo manager" funds (SM). Second, if CRSP reports "team" or "management team", we label these funds team-managed (T). A third category lists the names of two or more managers or reports a manager name and "et al." or "and team". As it is not quite clear, how this classification differs from the team-managed and solo manager funds, respectively, we exclude these funds from the final sample. A fourth category reports the name of a management company. These

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[4] Source: CRSPSM, Center for Research in Security Prices. Graduate School of Business, The University of Chicago. Used with permission. All rights reserved. For a more detailed description of the CRSP database, see Carhart (1997) and Elton, Gruber, and Blake (2001).

funds are also excluded from the sample since the precise management structure remains unclear.[5]

Our final sample spans the period from January 1994 to December 2003 and includes 14,848 yearly observations on US equity funds. It covers the years of the rapid growth of team-managed funds, as it can be seen from

. This figure plots the percentage of team and solo manager funds in our sample between 1994 and 2003.

– Insert FIGURE 1 about here –

In 1994, team-managed funds represent only about 5 % of the total number of equity funds. In the following years, this percentage grows rapidly, reaching about 46% in 2003. When looking at assets under management of solo- and team-managed funds during the same period, we find a similar development. Assets held by team-managed funds increase from 7 % in 1994 to about 50 % of total assets held by solo- and team-managed equity funds in 2003.

Summary statistics of our final sample are given in Table 1.

– Insert TABLE 1 about here –

The second column shows the characteristics of all funds. On average, sample funds are 9.7 years old and manage over 840 million USD. The mean turnover rate is slightly above 1.14

[5] For differences between anonymous and identified management teams, see Massa, Reuter, and Zitzewitz (2007).

and the average fee burden is 1.4 % p.a.[6] To compare the characteristics of solo- and team-managed funds, we report summary statistics of the two sub-samples in columns 3 and 4. The respective differences are reported in column 5. Team-managed funds are significantly younger (8.9 versus 10 years), have higher TNAs (997 versus 791 million USD), a higher turnover ratio (146 % versus 102 %), and lower fees (1.29 % versus 1.44 % p.a.) as compared to solo-managed funds.

Looking at the distribution of team- and solo-managed funds across sections we see considerable cross-sectional variation, as shown in Figure 2.

– Insert FIGURE 2 about here –

This figure plots the share of team- and solo-managed funds in each of the ten market segments for the year 2003. The balanced funds sector has the highest percentage of team-managed funds (61% in 2003), followed by the global equity funds and international equity funds segments (about 50 %). The share of team-managed funds is lowest for sector funds and in the utility funds segment (33 % and 39 %, respectively).

3. Managerial Behavior of Teams versus Solo Managers

We start our empirical investigation with an analysis of potential differences in management behavior between teams and solo managers that might be problematic from an investor's point of view and that are, consequently, also relevant from an operational risk management per-

[6] Following Sirri and Tufano (1998), we calculate total fees as the sum of a fund's expense ratio and 1/7 of its total loads.

spective. Specifically, we look at potential differences in style drift (3.1), tournament behaviour (3.2), and performance persistence (3.2).

3.1 Style Drift

Differences in the decision-making process of management teams and individual mangers might be reflected in the consistency of their investment decisions over time. From an investor's point of view, a drift in a fund's style can produce unwanted and unexpected style bets for individual portfolios. We expect teams to change their styles less as compared to solo managers because mutual monitoring should prevent rapid style changes that are not in the interest of investors. Furthermore, changes in the opinions of managers that might lead to style drift should be smoothed by the averaging effect of team decision-making (Baer, Kempf, and Ruenzi, 2008).[7]

We capture the investment style of a fund by the style dimensions "small-cap vs. large-cap", "value vs. growth", and "momentum vs. contrarian", respectively. We apply a return-based style classification approach and measure a fund's style based on the sensitivities of its return to the various factor benchmarks as suggested in Carhart (1997). For each fund, we construct the yearly factor weightings by estimating the following regression:

$$r_{i,m,t} - r_{f,m,t} = a_{i,t} + \beta_{i,t}^{1}\left(r_{M,m,t} - r_{f,m,t}\right) + \beta_{i,t}^{2} SMB_{m,t} + \beta_{i,t}^{3} HML_{m,t} + \beta_{i,t}^{4} MOM_{m,t} + \varepsilon_{i,m,t} \qquad (1)$$

[7] In addition, manager changes should have less disruptive effects on the investment styles of team funds than that of solo-managed funds. While teams will tend to hold on to their strategy even if individual members change, a new fund manager of an individually managed fund most likely adopts her own investment strategy which might differ considerably from the previous fund style (see, e.g., Jin and Scherbina, 2008).

The dependent variable is the monthly return of fund *i* in month *m* of year *t*, $r_{i,m,t}$, less the risk free rate in this month, $r_{f,m,t}$. The independent variables are the excess return of the market portfolio over the risk-free rate, $r_{M,m,t} - r_{f,m,t}$, and the returns on the three factor-mimicking portfolios that cover our three style dimensions: the size factor, *SMB*, calculated as the return difference between small and large capitalization stocks, the value factor, *HML*, calculated as the return difference between high and low book-to-market stocks, and the momentum factor, *MOM*, calculated as the return difference between stocks with high and low past returns.[8] A high factor weighting indicates that the fund manager follows a small-cap rather than a large-cap strategy (β^2), a value rather than a growth strategy (β^3), and a momentum rather than a contrarian strategy (β^4), respectively.

To compare the style consistency of solo- and team-managed funds, we construct a new quantitative style drift measure that captures a fund's style variability through time, based on its weightings on the SMB, HML, and MOM portfolios.[9] It is defined as the average standard deviation, S*TDev*, of a fund's three *factor weightings* over time:

$$SDM_i^{abs} = \frac{1}{3}\sum_f STDev^{resc}\left(Factor\ Weighting_f\right)_i. \qquad (2)$$

In this equation, *i* is the index for the individual fund and *f* represents the *f*th factor. *resc* indicates that the standard deviations are rescaled as to make them homogeneous across factors

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[8] The market, the size, and the value portfolio were taken from Kenneth French's site http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html, while the momentum factor was kindly provided by Mark Carhart.

[9] Alternative measures for style consistency are a fund's tracking error or the R^2 (e.g. Brown and Harlow, 2004). The former can be estimated as the volatility of the difference between fund returns and those to a corresponding benchmark. The latter, R^2, captures the portion of a fund's variability that is explained by the variance of benchmark portfolios. When benchmarks are adequately specified, these variables can indicate a fund's active risk. However, they do not necessarily capture a fund's style variability through time. A low R^2 as well as a high tracking error can result either from a constant investment strategy with a high level of unsystematic risk or from changing style bets.

and market segments.[10] A higher value of the style drift measure, SDM^{abs}, corresponds to a higher standard deviation of their factor weightings, and thus to a more volatile, i.e. less consistent style of this fund over time. It is defined not in relation to a typical fund in the respective market segment, but in absolute terms (as indicated by *abs*).

Alternatively, we also employ a modified version of this measure, SDM^{rel}, which captures a fund's style variation corrected for the movements of a typical fund with average style characteristics, S*tyle Benchmark,* in the respective market segment *k*. It is calculated as the average standard deviation, *STDev,* of the deviations of a fund's three factor weightings from their respective style benchmarks:[11]

$$SDM_i^{rel} = \frac{1}{3}\sum_f STDev^{resc}\left(\left(Factor\ Weighting_f\right)_i - \left(Style\ Benchmark_f\right)_k\right). \qquad (3)$$

A higher value of this style drift measure indicates a less consistent fund style, in the sense that it fluctuates more in relation to the style movements of a (hypothetical) fund with average style characteristics in the same segment.

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[10] To calculate this measure, we proceed in three steps. For each fund, we first compute the standard deviations of a fund's yearly factor weightings over time. We exclude funds that have less than 4 years of data. Next, we rescale the results by the average standard deviation of the respective factor in the respective market segment. In the last step, the rescaled standard deviations of the individual factors are averaged on the fund level to get a measure for the overall consistency of a fund's style.

[11] As SDM^{abs}, this measure is calculated in three steps. However, in the first step we compute the standard deviations of the *difference* between the individual fund factor weightings and the corresponding style benchmarks (defined as in the previous section). Accordingly, we rescale the results by the average standard deviation of this difference in the next step.

A typical fund with average style drift has, by construction, a (relative and absolute) drift measure of 1. Results of a comparison of our style drift measures between solo- and team-managed funds are presented in Table 2.

– Insert TABLE 2 about here –

Columns 2 and 6 of Table 2 show the average style drift measures (absolute and relative) for solo- and team-managed funds. The results are similar for the two measures: SDM^{abs} and SDM^{rel} are significantly lower for team-managed funds than for solo manager funds (0.81 versus 1.053 and 0.796 versus 1.049). This indicates that management teams, more than solo managers, hold on to their styles in absolute terms as well as in relation to the style movements of a typical fund with average style characteristics in the respective segment.

When looking at the average fluctuations of weightings for each of the three factors separately, we observe that management teams are significantly more consistent in their style in all of the three style dimensions, both in absolute terms as well as relative to the movements of a corresponding style benchmark. As can be seen from columns 3 to 5 and 7 to 9, team-managed fund weightings on the SMB, HML, and MOM portfolios as well as their deviations from style benchmarks fluctuate, on average, less than those of solo-managed funds.[12]

[12] We check the robustness of our results using multivariate regression analysis. Results (not reported) support our univariate findings.

3.2 Tournament Behavior

We next turn to an exploration of the question whether teams and solo managers differ with respect to their risk-taking behavior. More specifically, we examine how teams adapt their risk as compared to solo managers during the year dependent on their performance in the first part of the year. The idea that fund managers align their risk in a "tournament-like" fashion as response to their midyear rank was first proposed in Brown, Harlow, and Starks (1996). They argue that fund managers adjust the risk of their portfolio in the course of the year in order to increase their chance of reaching a top position by the end of the year. Reaching a top position is important, because the relationship between past performance and inflows is convex (Sirri and Tufano, 1998) and only the best performing funds experience large inflows and eventually a large compensation. Such behaviour is in the best interest of the fund manager, as it increases expected inflows and eventually compensation. However, it is not in the best interest of clients because expected performance decreases due to such activities (Huang, Sialm, and Zhang, 2008). Thus, engaging in tournament behaviour can clearly be interpreted as a mild form of managerial misconduct.

If team management fulfils its role as an operational risk management device, we should see less tournament behaviour among team-managed funds. Again, the idea is that every team member has to agree to engage in this form of misconduct which should make it less likely to happen. Another channel why teams might engage less in tournament behaviour is that many team members are part of different management teams. This regularly leads to situations, where they compete against other funds of which they are also part of the management team, i.e. they

compete against themselves.[13] As a result, risk-adjusting incentives due to their competitive position should be less pronounced for teams than for solo managers.

To estimate potential differences in the risk-adjustment strategies of teams and solo fund managers we apply a modified version of the model in Kempf and Ruenzi (2008):

$$\begin{aligned} Change\ in\ Risk_{i,t} = {} & \beta_1 \left(Perf\ Rank \right)_{i,t}^{(1)} + \beta_2 \left(Team\ Dummy \right)_{i,t} \cdot \left(Perf\ Rank \right)_{i,t}^{(1)} \\ & + \beta_3 \left(Risk \right)_{i,t}^{(1)} + \beta_4 \left(Change\ in\ Segment\ Risk \right)_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{4}$$

The dependent variable, *Change in Risk*$_{i,t}$, denotes the change in risk between the first and the second part of the year. It is defined as the difference between fund *i*'s annualized return standard deviations in the first and the second period of year *t*. $Perf\ Rank_{i,t}^{(1)}$ denotes the rank of fund *i* in its segment after the first part of year *t* based on its return in this period. In our regressions, we chose six months as the first part of the year.[14] According to Kempf, Ruenzi, and Thiele (2009), the sign of β_1 will be positive if employment incentives dominate in the period under consideration, and negative if compensation incentives dominate.

Our main interest is to examine differences in the behaviour between team and solo-managed funds. Thus, we interact the influence of $Perf\ Rank_{i,t}^{(1)}$ with a team-dummy. If teams really adjust their risk less than solo-manager funds, we expect β_2 to have the opposite sign of β_1 (and to be smaller in absolute terms than $2\,\beta_1$). As control variable we add the fund's risk in the first part of the year, $Risk_{i,t}^{(1)}$, to allow for mean reversion in risk (see Daniel and Wermers, 2000). We also include the change in segment risk, $Change\,in\,Segment\,Risk_{i,t}$, as additional explanatory variable

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[13] Some managers of solo-managed funds also manage more than one fund. However, they generally manage a smaller number of additional funds (if any) as compared to the number of additional funds an individual team member usually manages.

[14] Results remain stable if we choose seven or five months as the first part of the year.

to capture variations in the overall risk in the respective segment. This variable is calculated as the difference between the median standard deviations of returns in fund *i*'s segment in the first and the second part of the year.

– Insert TABLE 3 about here –

Findings are presented in Table 3. The positive influence of $Perf\ Rank_{i,t}^{(1)}$ indicates that winners increase risk more than losers do. However, the risk-changing of teams is less pronounced than that of solo-managers, as β_2 has the opposite sign of β_1.[15] The estimated coefficient of 0.0083 for β_1 and of -0.0046 for β_2, respectively, indicate, that teams only adjust risk by half the amount of the risk adjustment of solo-managed funds. This supports the idea teams are less susceptible to tournament behavior than individual managers.

3.3 Performance Persistence

Mutual funds are a long-term investment vehicle regularly used for retirement saving by many investors. These investors are typically interested in persistent long-term performance. However, differences in the consistency of investment styles through time, as documented in the previous sub-section, might also translate into differences in the performance persistence of solo- and team-managed funds (Bollen and Busse, 2005). If there is a positive relation between style consistency and performance persistence, as documented by Brown and Harlow (2004), we expect team-managed funds to show more persistent performance than solo-managed funds.

[15] Similar findings are reported in Qiu (2003) and in Kempf and Ruenzi (2008) for intra-family tournaments.

To investigate potential differences in performance persistence, we examine the returns to team and solo manager portfolios of funds sorted by past performance. Specifically, we proceed as follows: We first sort all mutual funds into solo-managed and team-managed fund portfolios at the end of each year. Second, we rank the funds within the two portfolios based on the 12-month objective adjusted return.[16] Funds with the highest (lowest) objective adjusted return go into portfolio 1 (10). After one year, portfolios are rebalanced. This is repeated throughout the sample until we eventually get a time series of monthly returns on these portfolios.

– Insert TABLE 4 about here –

For team- and solo-managed funds, fund portfolios sorted on adjusted past returns demonstrate a nearly monotonically decreasing excess return, as shown in the second column of Table 4. The average monthly spread between high and low rank portfolios is approximately 0.67% for solo-managed funds (Panel A) and 0.95% for team-managed funds (Panel B). As these return differences might be due to differences in the risk level of the decile portfolios, we also use the Carhart (1997) four factor model to control for risk and style. Results are presented in columns 3 to 7. We observe that for solo-managed funds, most of the spread in excess return can be explained by the four-factor model (58 basis-points of the 67 basis-point spread).[17] The remaining spread of 9 basis-points in monthly risk-adjusted returns is not statistically significant (p-value of 0.76). Thus, there is no evidence of performance persistence. Findings for the team portfolio look somewhat different. Corrected for risk, team-managed funds still exhibit a 63 basis-point

[16] Objective adjusted returns are fund returns in excess of the returns of the average fund in the respective market segment.

[17] In line with the findings of Carhart (1997), the momentum factor accounts for most of the explanation (about 54 basis-points).

spread in monthly returns, which is statistically significant (p-value of 0.07). Only about one third of the 95 basis-point spread in monthly excess returns can be explained by the four factor model. Thus, contrary to the results on solo-managed funds, the performance of team-managed funds persists on a risk-adjusted basis.

In order to directly compare the persistence of team- and solo-managed funds, we calculate the difference in spreads between team and solo manager portfolios. Findings presented in Panel C of Table 4 indicate that team-managed funds are significantly more persistent in their performance as compared to solo-managed funds. Their spread in monthly risk-adjusted returns is, on average, 54 basis points higher than that of the solo manager portfolio. This confirms the idea that teams ensure a higher continuity in management which leads not only to a more consistent style, but, eventually, also to higher persistence of fund performance.

Overall, the results from Section 3 show a very uniform picture. Teams seem to be preferable from a client's point of view: the likelihood of human error or misconduct in terms of frequently switching styles and engaging in value-destroying tournament behaviour is clearly lower among teams than among solo-managers and the first deliver more stable performance outcomes. This suggests that employing teams is a way to mitigate several kinds of operational risks related to human error or misconduct.

4. Cost and Benefits of Employing Teams and Solo Managers

The former section provides evidence that management teams and solo managers differ with respect to their investment style, risk taking and performance persistence. While teams seem to be preferable from an operational risk management perspective, it is still not obvious that teams rather than solo managers should be employed. The reason for this is that the costs of using a team might be larger than the benefits in terms of reduced operational risk. The costs of using a

team can come in two forms. First, teams might be more expensive as more managers have to be paid. However, possibly the same individuals might be employed in several teams. Thus it is not clear whether teams are really more expensive. Any difference in costs should be reflected in differences in expense ratios. Second, mutual monitoring within teams might be costly as not all team members can fully concentrate on managing the fund (Lazear, 1991), monitoring might decrease work motivation (Drago, 1991), and moral hazard in teams might decrease the effort of the individual team members (Holmstrom, 1982). This could have a negative impact on gross-returns. Both of these effects (higher expenses and lower gross-returns) would show up in differences in net-returns. On the other hand, there might also be benefits of operational risk management for fund management companies, if investors value such practices. If investors do indeed prefer more stable performance, less risk gambling of fund managers in tournaments and more stable investment styles, this should be reflected in higher inflows. Higher inflows are in the interest of fund companies, as inflows increase assets under management and fund companies typically get compensated by a percentage fee on assets under management. In the following we will analyse consequences of a fund's management status on fund performance (4.1) and fund-inflows (4.2).

4.1 Fund Performance

Recognizing that solo- and team-managed funds have different characteristics and also differ with respect to their risk taking, we analyse risk adjusted performance controlling for several fund individual factors in a multivariate setting. We estimate the following regression:

$$Perf_{i,t} = \beta_1(Team\ Dummy)_{i,t} + \beta_2(Perf)_{i,t-1} + \beta_3(Age)_{i,t-1} + \beta_4(Size)_{i,t-1} + \beta_5(Turnover)_{i,t-1} + \beta_6(Expenses)_{i,t-1} + \sum_k \beta_k(Segment)_{i,t} + \sum_y \alpha_y \cdot D(y)_{i,t} + \varepsilon_{i,t} \quad (5)$$

Performance ($Perf_{i,t}$) is measured by a fund's (Carhart, 1997) four-factor model alpha in year *t*.[18] *Team Dummy* reflects the management structure and equals one if the fund is managed by a team, and zero otherwise. *Expenses* denotes a fund's expense ratio, *Age*, *Size* and *Turnover* are defined as the logarithm of the fund's age in years and its assets under management in million USD respectively, and the fund's yearly turnover ratio. To control for segment- and year-specific effects, (5) also includes segment and time dummies. Results are presented in Table 5.

– Insert TABLE 5 about here –

The second column of Table 5 shows a negative relation between team management and fund performance. Team-managed funds underperform solo manager funds by about 0.056 percentage points per month. The coefficient on the team dummy is significant at the 5 % level. These results suggest that fund management teams are moderately less efficient than solo managers.

Refining the analysis to consider possible differences in unsystematic risk between team and solo-managed funds, we re-estimate our regression using an extended version of the appraisal ratio of Treynor and Black (1973) as an alternative performance measure. It is calculated by dividing the four-factor Carhart (1997) alpha by the standard deviation of the residuals from the four- factor regression. If team-managed funds tend to take on less unsystematic risk than solo-managed funds as suggested by the results in Baer, Kempf, and Ruenzi (2008), we would expect

[18] We use the Carhart (1997) four factor alpha computed based on returns after expenses.

that the negative relation between team management and fund performance becomes less pronounced.

The regression results using the appraisal ratio are presented in the third column of Table 5. Consistent with our earlier findings, we observe a negative relation between team management and fund performance. However, the underperformance of team-managed funds now is only significant at the 10 % level. Overall, these results show that the impact of team status on performance is only minor. We now turn to the question, whether investors shy away from team-managed funds because of this, or whether they value the favourable characteristics of team-managed funds documented in Section 3.

4.2 Fund Inflows

While fund investors mainly care about performance, fund management companies are ultimately interested in net-inflows of new money, as they earn their fee income on their assets under management. Therefore, we examine which consequences team management has in terms of inflows of new money. As team and solo-managed funds differ along several characteristics (see Table 1) and there are many other characteristics that have been shown to influence fund inflows in previous studies (see, e.g., Sirri and Tufaon, 1998, and Barber, Odean, and Zheng, 2005), we estimate the following multivariate model:

$$\begin{aligned} Fund\ Flow_{i,t} = {} & \beta_1 \left(Team\ Dummy\right)_{i,t-1} + \beta_2 \left(Fund\ Flow\right)_{i,t-1} + \beta_3 \left(Perf\ Rank\right)_{i,t-1} \\ & + \beta_4 \left(Perf\ Rank\right)^2_{i,t-1} + \beta_5 \left(Risk\right)_{i,t-1} + \beta_6 \left(Age\right)_{i,t-1} + \beta_7 \left(Size\right)_{i,t-1} \\ & + \beta_8 \left(Turnover\right)_{i,t-1} + \beta_9 \left(Fees\right)_{i,t-1} + \beta_{10} \left(Segment\ Flow\right)_{i,t} \\ & + \beta_{11} \left(Family\ Size\right)_{i,t-1} + \beta_{12} \left(Family\ Age\right)_{i,t-1} + \beta_{13} \left(Family\ Flow\right)_{i,t} \\ & + \sum_y \alpha_y \cdot D(y)_{i,t} + \varepsilon_{i,t} \end{aligned} \qquad (6)$$

The dependent variable are the net-inflows into fund *i* in year *t*, $Fund\ Flow_{i,t}$. As no data on net-flows are available in our database, we follow Sirri and Tufano (1998) and construct a synthetic measure of net inflows by subtracting the rate of return of the fund (i.e. the fund's internal growth rate) from the total growth of its assets under management.[19] This measure captures the growth of a fund which is due to the net-inflow of new money.

To capture the influence of the management structure on a fund's net inflows, we use a team dummy, *Team Dummy*, as explanatory variable. Besides, we control for the influence of several other variables that are used in the literature: $Fund\ Flow_{i,t-1}$ is the external growth rate of the fund in the previous year. We also have to control for past performance: Sirri and Tufano (1998) show that investors react asymmetrically to past performance. To capture this non-linearity of the performance-flow relationship, we follow Barber, Odean, and Zheng (2005) and use the lagged return-rank of a fund in its segment, $Rank_{i,t-1}$, and the square of the past performance rank as additional explanatory variables.[20] We also control for the influence of fund risk, *Risk*, the fund's age in years, *Age*, its assets under management, *Size*, its turnover rate, *Turnover*, its fees, *Fees*,[21] the external growth of the segment the fund belongs to (net of the fund's external growth rate), *Segment Flow*, the size of the family a fund belongs to, *Family Size*, the age of the fund's family, *Family Age*, and the external growth rate of the fund's family (net of the fund's external growth rate), *Family Flow*. Estimation results are presented in Table 6.

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[19] Thereby, we implicitly assume that all new money flows into the fund at the end of the year. Results do not hinge on this assumption; they are very similar if we assume that new money flows into the fund at the beginning or in the middle of the year. Furthermore, the use of the synthetic flow measure does not systematically influence the results of performance-flow studies (Ber and Ruenzi, 2005).

[20] We also use the piecewise-linear regression approach suggested in Sirri and Tufano (1998) to capture the convexity of the performance-flow relationship. Results are very similar.

[21] All variables that are not known to the investor at the beginning of year *t* are included with their values at the end or in year *t-1*. In accordance with the literature, we use the logarithm of the age and size of the fund and the family.

– Insert TABLE 6 about here –

We find a significantly positive influence of the team dummy on fund inflows. The estimate of 0.0503 indicates that team-managed funds grow by over 5% more than solo-managed funds. Given the average yearly growth rate due to net-flows of about 20% this effect is also economically meaningful and clearly dominates the negative impact of the slightly lower performance of team-managed funds. Our results indicate that investors prefer the more consistent investment styles followed by teams and the stronger persistence of their performance and that they dislike the risk gambles solo-managers engage in more heavily. The higher inflows into team-managed funds might also explain why so many fund families have used the team management approach in recent years, although the (small) differences in fund performance documented above would rather suggest employing solo managers.

In sum, our analysis of the consequences of team management shows that team-managed funds slightly underperform solo-managed funds. However, they experience significantly larger inflows as compared to solo-managed funds.

5. Implications for Operational Risk Management

Chevalier and Ellison (1999a, 1999b) argue that the mutual fund industry is an ideal laboratory to analyse managerial outcomes in detail, as the behavior of managers can easily be inferred from the time series of returns. The industry also places a number of managers in similar positions, that is, managing funds with similar objectives. Consequently, cross-sectional differences in behaviour are also possible to observe. In this paper, we show that team-managed funds tend to exhibit more consistent investment style, engage less in tournament behavior, and show

more persistent performance than funds managed by a solo manager. Although team-managed funds slightly underperform solo-managed funds, investors still appear to value the positive characteristics of the first. They reward team-managed funds with higher levels of flows.

Why are these results relevant to operational risk management? First, the literature in risk management has yet to identify specific examples of risk management decisions. Cummins, Lewis, and Wei (2006) argue that "operational risk can be considered as risk created by the production of goods and services for the clients of a financial services firm" (p. 2608). Our research suggests that the choice of team or solo-manager can be interpreted as a specific operational risk management decision. Beyond specific identification, our research also permits the direct measurement of the consequences of such a risk management decision. The Based Committee (2002) operational risk framework explicitly mentions losses "arising from unintentional or negligent failure to meet a professional obligation to specific clients." The fund manager (team or solo) is clearly of primary importance to clients (investors) as the manager makes the investment decisions in the portfolio. As described above, our research is able to quantify that the choice of a team results in a more consistent portfolio management strategy, less tournament behavior, and more persistent performance. In the context of portfolio management, these attributes are highly desirable to clients.

We can also demonstrate that a fund sponsor is rewarded for managing operational risk. The literature, heretofore, has been unable to make this connection. In the context of team-managed funds, we can isolate the impact in terms of new cash flows to the fund sponsor. We observe that investors value the risk characteristics of team management and reward funds accordingly.

6. Conclusion

Operational risk management has become a topic of immense interest in both the academic and professional literature. The financial services industry, in particular, has witnessed the development of the Basel framework as an architecture for the management of operational risk. To this point, however, the inability to isolate and measure the impact of specific operational risk management decisions has hindered the advancement of this discipline.

This paper takes on the challenges of identification and measurement using a ten-year sample of open-end equity mutual funds. We show that employing teams instead of solo managers for running a fund can be an effective mechanism to manage operational risk. Teams reduce the frequency of investment behavior that is not in the best interest of investors (e.g. engaging in value-destroying tournaments or frequently switching styles). Our findings further suggests that the costs associated with employing teams in terms of fund performance are minor and that clients value team management by allocating more money to team-managed funds.

By interpreting the decision to employ a team rather than a solo manager to run a fund as an operational risk management decision, this study can only offer a first step towards understanding the effects of operational risk management. Of course, much more work is needed to further inform the ongoing debate on how to measure and manage operational risk in a broader context.

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Figure 1

Mutual Fund Management Structures

This figure plots the percentage of solo manager and team-managed funds in our sample between 1994 and 2003.

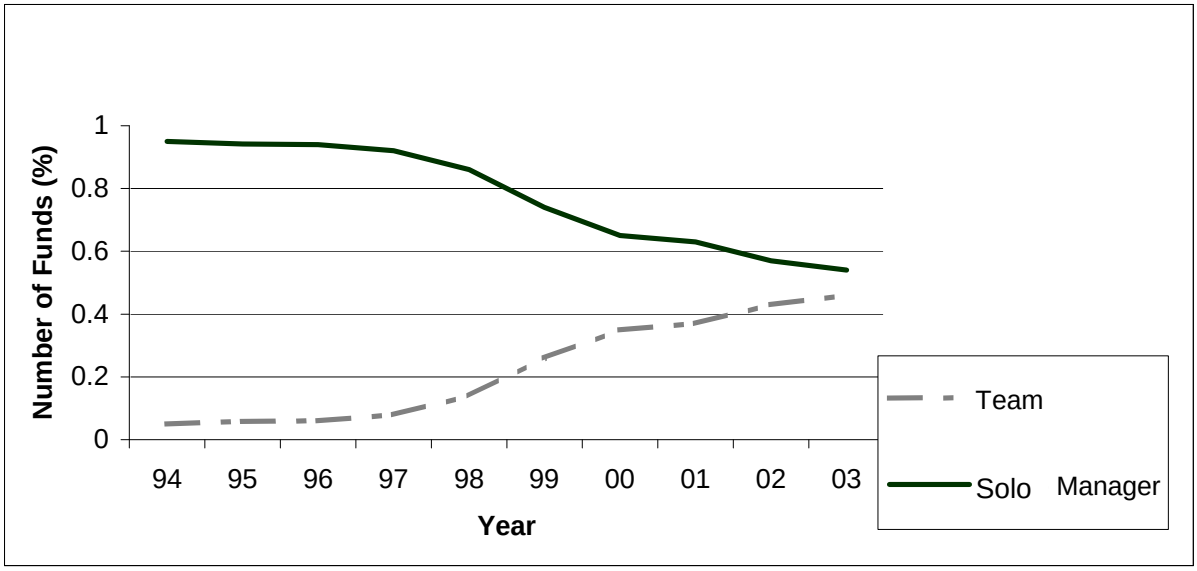
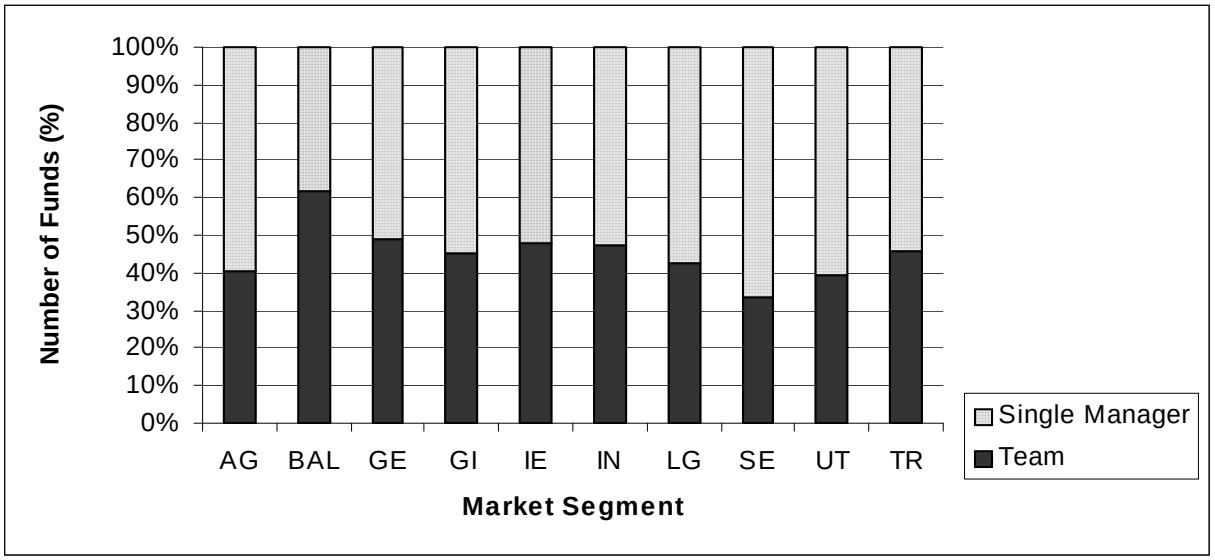


Figure 2

Mutual Fund Management Structures by Market Segment

This figure plots the percentage of solo- and team-managed funds in different market segments for the year 2003. The ICDI objective code, identified by Standard & Poors's Fund Services, is used to define market segments: aggressive growth (AG), balanced (BAL), global equity (GE) global income (GI), international equity (IE) income



(IN), long term growth (LG), sector (SE), utility (UT), and total return (TR).

Table 1

Summary Statistics

Table 1 presents summary statistics of the actively managed equity mutual funds included in the paper. Funds are grouped by their management structure (All, Team, and Solo Manager). The last column shows the differences in fund characteristics between team- and solo-managed funds. The number of observations is 14,848.

	All (Mean)	Team (Mean)	Solo Manager (Mean)	Difference (Mean)
Age (in Years)	9.70	8.86	10.04	-1.18***
Total Net Assets (in Millions)	842.04	997.22	791.01	206.21***
Turnover Ratio (in %)	114.02	145.86	101.56	44.30***
Total Fees (in %)	1.40	1.29	1.44	-0.15***

*** 1 % significance, ** 5 % significance, * 10 % significance

Table 2

Style Drift

This table reports the average style drift of team- and solo-managed funds and their difference in the sample period (1994 – 2003). Style drift captures a fund's style variability through time, measured as the average standard deviation of the three factor loadings on the SMB, HML, and MOM portfolios (absolute style drift, SDM^{abs}) and the average standard deviation of the individual deviations of the three factor loadings from style benchmarks (relative style drift, SDM^{rel}), respectively. Column 2 and 7 show the results on the aggregate style drift measures, SDM^{abs} and SDM^{rel} , as defined in (2) and (3), respectively, in the main text. Columns 3 – 5 and 7 – 9 present the average deviation of the factor weightings from style benchmarks for each of the three factors separately. The number of observations is 1,405.

	Style Drift							
	absolute				**relative**			
	SDM^{abs}	**SMB**	**HML**	**MOM**	**SDM^{rel}**	**SMB**	**HML**	**MOM**
Solo Manager (SM)	1.053	1.047	1.030	1.081	1.049	1.045	1.036	1.067
Team (T)	0.809	0.804	0.861	0.762	0.796	0.815	0.850	0.723
Team – Solo Manager	-0.244***	-0.244***	-0.169***	-0.319***	-0.253***	-0.231***	-0.186***	-0.344***

*** 1 % significance, ** 5 % significance, * 10 % significance

Table 3

Tournament Behaviour

This table reports the coefficients of the following regression:

$$Change\,in\,Risk_{i,t} = \beta_1 \left(Perf\ Rank \right)_{i,t}^{(1)} + \beta_2 \left(Team\,Dummy \right)_{i,t} \cdot \left(Perf\ Rank \right)_{i,t}^{(1)} + \beta_3 \left(Risk \right)_{i,t}^{(1)} + \beta_4 \left(Change\ in\ Segment\ Risk \right) + \varepsilon_{i,t}$$

Change in Risk$_{i,t}$ is measured by the difference between the standard deviations of individual fund *i*'s return in the first and the second part of year *t*. *Perf Rank* denotes the return rank of the fund *i* in its segment after the first part of the year. *Team Dummy* is a dummy variable that takes on the value one, if the fund is team-managed, and zero otherwise. *Change in Segment Risk* reflects the change in risk of fund *i*'s segment and is measured by the difference between the median standard deviations of fund returns in the respective segment in the first and the second part of the year. The number of observations is 14,848.

	Estimated Coefficients
Performance Rank (first part of the year)	0.0083***
Team Dummy · Performance Rank	-0.0040**
Risk (first part of the year)	-0.3624***
Change in Segment Risk	0.8886***
R^2	66.86%

*** 1 % significance, ** 5 % significance, * 10 % significance

Table 4

Performance Persistence

This table reports the summary statistics on portfolios of team-managed funds (Panel A) and solo-managed funds (Panel B) formed on their previous 12 month objective adjusted return. At the end of each year, funds are sorted according to their management structure into solo manager and team portfolios. For each of the two portfolios, funds are ranked based on the 12-month objective adjusted return. Funds with the highest (lowest) return go into portfolio 1 (10). The decile portfolios are rebalanced yearly. Column 2 shows the yearly excess return on the decile portfolios, columns 3 to 7 present the results for the Cahrhart (1997) four factor model. Panel C summarizes the results on the differences in the spread (1 – 10) between team and solo manager portfolios. The number of observations is 14,831.

		Four Factor Model				
Portfolio	**Excess Return**	**Alpha**	**Market**	**SMB**	**HML**	**MOM**
		Panel A: Solo Manager				
1	0.00884	-0.00172	0.98359	0.48402	-0.02486	0.26823
2	0.00741	-0.00136	0.93627	0.28402	0.09549	0.11848
3	0.00696	-0.00144	0.92309	0.19367	0.11858	0.10259
4	0.00632	-0.00108	0.90059	0.10484	0.11943	0.03531
5	0.00557	-0.00122	0.86714	0.08116	0.12405	0.00096
6	0.00510	-0.00151	0.86502	0.07611	0.16754	-0.03196
7	0.00478	-0.00152	0.87256	0.07090	0.16025	-0.06569
8	0.00370	-0.00275	0.90897	0.10909	0.18014	-0.09459
9	0.00350	-0.00289	0.93737	0.17201	0.16993	-0.13331
10	0.00216	-0.00265	0.97846	0.25514	0.03013	-0.29347
1 – 10 Spread	0.00668	0.00093	0.00513	0.22888***	-0.05499	0.56169***
		Panel B: Team				
1	0.00970	0.00007	0.90381	0.41795	-0.09773	0.27418
2	0.00681	-0.00201	0.88714	0.26813	0.05897	0.17805
3	0.00656	-0.00149	0.82624	0.10342	0.06598	0.06109
4	0.00542	-0.00032	0.83589	0.09234	0.11208	0.03545
5	0.00464	-0.00261	0.86688	0.06672	0.17395	0.03267
6	0.00523	-0.00073	0.81713	-0.00004	0.09770	-0.01826
7	0.00415	-0.00192	0.83950	0.09957	0.20044	-0.03377
8	0.00261	-0.00398	0.84707	0.08370	0.14661	-0.06857
9	0.00319	-0.00393	0.97694	0.16555	0.22182	-0.10455
10	0.00019	-0.00623	1.05332	0.22171	0.16295	-0.22383
1 – 10 Spread	0.00951	0.00631*	-0.14951*	0.19625**	-0.26068	0.49802***
		Panel C: Difference Team – Solo Manager				
1 – 10 Spread	0.00283	0.00538**	-0.15464***	-0.03264	-0.20568***	-0.06367**

*** 1 % significance, ** 5 % significance, * 10 % significance

Table 5

Performance Analysis: Multivariate Regression

This table reports the coefficients of the following regression:

$$Perf_{i,t} = \beta_1 \left(Team\,Dummy\right)_{i,t} + \beta_2 \left(Perf\right)_{i,t-1} + \beta_3 \left(Age\right)_{i,t-1} + \beta_4 \left(Size\right)_{i,t-1} + \beta_5 \left(Turnover\right)_{i,t-1} + \beta_6 \left(Expenses\right)_{i,t-1} + \sum_k \beta_k \left(Segment\right)_{i,t} + \sum_y \alpha_y \cdot D(y)_t + \varepsilon_{i,t}$$

Perf is the abnormal return of fund *i*, measured by the Carhart (1997) four factor model and a modified version of the appraisal ratio of Treynor and Black (1973), respectively. *Team Dummy* equals one if the fund is managed by a team, and zero otherwise. *Age* is the logarithm of age and *Size* is the logarithm of total net assets. *Turnover* denotes the turnover ratio and *Expenses* denotes the expense ratio. Regressions include market segment, *Segment*, and time dummies, *D(y)*. The number of observations is 13,228.

	Four Factor Abnormal Return	**Appraisal Ratio**
Team Dummy (T)	-0.00056**	-0.0295*
Previous Performance	-0.01536	0.03277***
Age	0.00051***	0.01913**
Size	-0.00049***	-0.02082***
Expenses	-0.17034***	-0.695635***
Turnover	-0.00008	-0.00962***
R^2	0.195	0.173

*** 1 % significance, ** 5 % significance, * 10 % significance

Table 6

Fund Flows

This table reports the coefficients of the following regression:

$$\begin{aligned} Fund\ Flow_{i,t} = {} & \beta_1 (Team\ Dummy)_{i,t-1} + \beta_2 (Fund\ Flow)_{i,t-1} + \beta_3 (Perf\ Rank)_{i,t-1} + \beta_4 (Perf\ Rank)^2_{i,t-1} + \beta_5 (Risk)_{i,t-1} \\ & + \beta_6 (Age)_{i,t-1} + \beta_7 (Size)_{i,t-1} + \beta_8 (Turnover)_{i,t-1} + \beta_9 (Fees)_{i,t-1} + \beta_{10} (Segment\ Flow)_{i,t} \\ & + \beta_{11} (Family\ Size)_{i,t-1} + \beta_{12} (Family\ Age)_{i,t-1} + \beta_{13} (Family\ Flow)_{i,t} + \varepsilon_{i,t} \end{aligned}$$

$Fund\ Flow_{i,t}$ is the relative growth of fund *i* in year *t* due to inflows of new money. *Team Dummy* is a dummy variable that take on the value one if fund is managed by a team, and zero otherwise. *Perf Rank* is the return rank of the individual fund *i* in its segment, while *Risk* denotes the annualized return standard deviation of this fund. *Age, Size, Turnover,* and *Fees* denote the logarithmn of the age of fund *i*, the logarithm of the total net assets under management of the fund, the turnover rate of the fund and the fee burden of the fund. *Segment Flow* and *Family Flow* is the growth rate of the segment and the family a fund belongs to, respectively, which is due to inflows of new money. These values are calculated net of the inflows into fund *i*. *Family Size* and *Family Age* are the logarithm of the total net assets under management (net of the total net assets of the respective fund) in fund *i's* family and the age of the family of fund *i*. All explanatory variables, except *Segment Flow* and *Family Flow* are lagged by one year. The number of observations is 6,928.

	Estimated Coefficients
Team Dummy	0.0504**
Previous Flow	0.0623***
Previous Performance Rank	-0.2762
Squared Previous Performance Rank	0.8088***
Previous Fund Risk	0.5584
Age	-0.0071
Size	-0.1390***
Previous Turnover	0.0032
Fees	-1.5303
Segment Flow	0.7068***
Family Size	0.0527***
Family Age	0.0245
Family Flow	0.9364***
R^2	16.01%

*** 1 % significance, ** 5 % significance, * 10 % significance