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Tournaments in Mutual Fund Families

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ABSTRACT

In this paper we examine intra-firm competition in the U.S. mutual fund industry. Our empirical study shows that fund managers within mutual fund families compete against each other. They adjust the risk they take dependent on the relative position within their fund family. The direction of the adjustment crucially hinges on the competitive situation within a family. Funds from small families behave in the opposite way than funds from large families. The results are very robust. They hold for different time periods and for different subgroups of funds.

Most mutual funds belong to a multi-fund family.[1] Several recent papers study the behavior of such fund families. Khorana and Servaes (2004), Mamaysky and Spiegel (2002), and Siggelkow (2003) look at the product policy of fund families. Gaspar, Massa, and Matos (2004) and Guedj and Papastaikoudi (2004) study how fund families shift performance between their funds. All of these papers focus on the decisions of the top management of a fund family, but they neglect the decisions that managers of an individual fund have to take. They implicitly assume that fund families are coordinated entities.

Our paper is the first to study the behavior of individual fund managers in the context of their fund family. It is important to analyze the behavior of fund managers in this context since the top management of the fund family sets the incentives for the family's fund managers. The top management decides which managers to promote and which funds to advertise. If a fund manager gets promoted she will increase her salary. Marketing efforts directed to a fund also indirectly increase manager's salary, because such efforts attract higher inflows (see Jain and Wu (2000), and Gallaher, Kaniel, and Starks (2004)) and fund managers get paid dependent on their assets under management (see, e.g., Khorana (1996)). Since only a select group of managers will be promoted and the overall budget of a fund family for marketing activities is limited, the fund managers within a family compete against each other for these scarce resources.

There are fixed dates at which the fund family decides about advertisement for funds and which fund managers to promote. A typical date is the end of the year, when the decisions for the following year are taken. Therefore, fund managers try to reach a top position within the fund family by the end of the year. If they succeed they will be advertised for and possibly promoted, if not they go away empty-handed. It then makes no big difference whether the fund manager reaches a middle position or a bottom position. [2] This is a typical tournament situation, where the winner gets the prize and the losers end up with nothing. In such a tournament, the optimal response of a fund manager to its interim performance is an adjustment of its risk taking. This maximizes the fund's probability to reach a top position at the end of the year (see, e.g., Taylor (2003) and Acker and Duck (2001)). In this paper we empirically examine whether fund managers engage in such a *family tournament*. Knowledge of the existence of a family tournament is highly relevant because tournament behavior of fund managers leads to suboptimal portfolios from the fund investors' point of view and to irrational price formation in asset markets (see James and Isaac (2000)). Therefore, knowledge about such tournament behavior of fund managers is also relevant for regulatory authorities.

The second main question we address in this paper is whether fund manager's in large families behave differently from managers in small families. Such differences in the behavior can arise because the competitive situation in large and small families differs. In large families with a lot of competing funds the competitive situation resembles atomistic competition. In contrast, the situation in small families with only few funds is similar to oligopolistic competition. In the first case we expect no strategic interaction between fund managers, whereas fund managers might interact strategic in the latter case. Taylor (2003) shows that the optimal behavior of fund managers that interact strategic is totally different from the behavior of fund managers that do not act strategic. Therefore, it is likely that the behavior of funds in small and large families differs.

Our empirical study of the US mutual fund market provides two main results: first, a family tournament exists. Fund managers adjust the risk of their funds in the course of a year dependent on their interim position within the family. Thereby, they try to maximize the probability of reaching a top position within their family by the end of the year. Second, fund managers in large and small families behave completely different in the family tournament. We observe strategic behavior in small families and non-strategic behavior in large fund families.

Ours is the first paper to analyze the competition of funds within their family. Nevertheless, our research is related to three strands of literature: first, we extend the literature on fund families (see, e.g., Mamaysky and Spiegel (2002), Khorana and Servaes (2004), Siggelkow (2003), Gaspar, Massa, and Matos (2004), Guedj and Papastaikoudi (2004) and Nanda, Wang, and Zheng (2004)) by examining how fund managers behave *within* their family. Second, we contribute to the literature on intra-firm competition (see, e.g., Baye, Crocker, and Ju (1996), Corchon and Gonzalez-Maestre (2000), and Ruebeck (2002)) by delivering empirical evidence of intra-firm competition in the mutual fund industry. Third, we complement the literature on tournaments in mutual fund market segments by showing that funds engage in a family tournament as well as in the well-documented segment tournament.[3]

The schedule of the paper is as follows: Section I describes the data. In Section II we take a first look at the family tournament. Section III examines the family tournament in more detail by studying the impact of competition on tournament behavior. In Section IV we examine the influence of fund characteristics on tournament behavior. Section V confirms the temporal stability of our results and Section VI concludes.

I. Data

Our sample consists of data on US equity funds from the CRSP Survivorship Bias Free US Mutual Fund Database.[4] The database contains data on monthly total returns, the fund management company, and other characteristics of the fund like, for example, its year of origin and its size. We use the Strategic Insight Objectives (SI) of funds to define the market segments in which funds operate. As the SI classification is available from 1993 on, our data sample starts in 1993. It ends in 2001 leaving us with 9 years of data.

In the observations, we eliminate those years of a fund for which some of the data is missing. All examinations are done for fund families and segments including more than two funds. The CRSP database lists every single share class of a fund as an individual entry. These share classes only differ with respect to their fee structure or their minimum investment requirements, but are backed by the same portfolio of assets. Since they can not be managed independently, we omit all classes of multiple class funds except for the first class of these funds in our dataset. The first class in the dataset is usually the oldest and largest share class of the fund. To simplify expressions we will term the remaining share class in our sample 'fund'. These exclusions reduce our initial number of yearly fund observations from 41.367 to 22.756.

We use the return data from our dataset to calculate the rank of a fund i at the end of the first part of year t within its family and within its segment. The *segment rank* of a fund, R_{it}^S, is determined by its total return relative to the total returns of the competing funds in its segment:[5] the rank is calculated by placing the funds of a segment in order according to their total returns and assigning numbers to them in descending order. For example, in a group of five funds the worst fund gets rank number 1 and the best fund rank number 5. These rank numbers are normalized to make segments of different size comparable. After this normalization the segment ranks, R_{it}^S, are distributed evenly between 0 and 1. A higher R_{it}^S denotes a better performance within a segment.

To measure the *family rank* of a fund, R_{it}^F, we arrange all funds of a family according to their segment ranks, R_{it}^S. Based on this ordering, we then assign a family rank number to each fund. This 'rank-of-ranks' method ensures that the performance of funds from different segments can be compared. A normalization similar to the one described above is conducted in order to make ranks from families of different size comparable. R_{it}^F is evenly distributed between 0 and 1. A higher R_{it}^F denotes a better performance within a family.

The correlation between R_{it}^S and R_{it}^F is positive by construction. For the whole sample the correlation coefficient between these two variables is 0.78, indicating that multi-collinearity might be a problem. Even in this case one still gets consistent and unbiased estimators. However, standard errors will be high and it is therefore harder to get significant results.

— Please insert TABLE 1 approximately here —

In Table 1 the rapid growth of the mutual fund industry is documented. The number of mutual funds in our sample increases from 1175 funds in 1993 to 3865 funds in 2001. The number of fund families rises from 238 to 383. The average amount of assets under management in a family increases from about 3 billion USD to more than 8 billion USD.

In the remainder of this paper we concentrate on funds belonging to the three largest segments (Growth, Growth & Income, Small Company Growth), leaving us with 10,321 yearly fund observations. We concentrate on these segments for three reasons. First, we want to make our sample homogeneous with respect to the competitive situation in the market segment. A large number of funds belong to each of our three segments in every year. We can safely assume that the competition within these segments is atomistic. Hence, concentration on large segments allows us to examine the effect of the competitive situation within the family in isolation. Second, we want to make our sample homogeneous with respect to the ease of risk adjustment. All funds in our sample are well-diversified and have similar opportunities to adjust risk. Third, we want to compare our results on the family tournament with earlier papers on the segment tournament (e.g. Brown, Harlow, and Starks (1996)) that focus on large market segment.

II. A First Look at the Family Tournament

The basic structure of the family tournament is as follows: Fund managers observe their family rank in the middle of the year. Based on this rank they decide on the risk they take in the second half of the year. We estimate the risk adjustment strategy using the following pooled regression:

$$\Delta\sigma_{it} = b^F R_{it}^F + b^S R_{it}^S + b_1 \Delta\sigma_{it}^m + b_2 \sigma_{it}^{(1)} + \sum_{j=T_1}^{T_2} a_j D_j + e_{it}. \tag{1}$$

The dependent variable, $\Delta\sigma_{it} := \sigma_{it}^{(2)} - \sigma_{it}^{(1)}$, is the change in standard deviations of fund returns from the first to the second part of the year.[6] $\sigma_{it}^{(1)}$ ($\sigma_{it}^{(2)}$) denotes the estimated annualized standard deviation of monthly returns of fund i in the first part (second part) of year t. In line with the literature on segment tournaments we choose a length of 7 months as the first part of the year (see, e.g., Brown, Harlow, and Starks (1996)). During the following 5 months portfolio managers are able to adjust the risk of their portfolio. The (7,5)-partitioning is reasonable because a lot of interim rankings are set up roughly at the middle of the year and it takes some time for fund managers to adjust their portfolio afterwards.[7]

The main explanatory variable in (1) is the family rank, R_{it}^F. A significant coefficient b^F is consistent with the existence of a family tournament. A positive (negative) b^F indicates strategic (non-strategic) behavior.

We control for other effects that might influence $\Delta\sigma_{it}$. Based on the literature, we expect an influence of the segment rank of a fund, R_{it}^S (see, e.g., Brown, Harlow, and Starks (1996)). Furthermore, we control for changes in the segment volatility by adding $\Delta\sigma_{it}^m$. This variable is calculated from the median standard deviation in the first part of the year, $\sigma_{it}^{m(1)}$, and in the second part of the year, $\sigma_{it}^{m(2)}$, i.e. $\Delta\sigma_{it}^m := \sigma_{it}^{m(2)} - \sigma_{it}^{m(1)}$.[8] We also expect mean reversion in funds' volatility (see, e.g., Daniel and Wermers (2000), and Koski and Pontiff (1999)). Therefore, we add $\sigma_{it}^{(1)}$ as control variable in our regression. Finally, we include a dummy variable D_j for each year of the sample to control for year-specific effects. Such effects can be caused by, e.g., the aggregate liquidity in the market, which is higher in some years than in others due to business cycle patterns (see Rockinger (1995)).

— Please insert TABLE 2 approximately here —

Table 2 provides the estimation results of model (1). Our main focus is on the coefficient of the family tournament, b^F. The influence of the family rank is positive and statistically significant at the 5%-level. We can reject our null-hypothesis that the family rank has no influence on risk taking ($b^F = 0$). However, our results indicate that the best fund in a family increases risk by only 0.5 percentage points more than the worst fund. This result is consistent with strategic behavior of fund managers in the family tournament, but the influence of the family rank seems to be economically weak.

However, this interpretation is misleading. In the next section we show that the family rank has a strong impact on risk taking if we allow for differences in the influence dependent on the competitive situation within the family.[9] The results there suggest that the weak results in Table 2 can be explained by the fact that managers in some families compete strategic and managers in other families do not. Erroneously, model (1) does not distinguish between these different risk adjustment strategies. As they are of opposite direction, they cancel out if we do not account for these differences.

III. Family Tournament and Competition

We now turn to a more detailed examination of the impact of the family rank. We distinguish between funds belonging to small families and funds belonging to large families. Our hypothesis is that strategic interactions take place between funds in small families, but not between funds in large families. In small families the fund has only a few intra-firm competitors and can therefore take the actions of them into account. In contrast, in large families there are a lot of competitors. In such a situation of atomistic competition, strategic interactions are irrelevant.

We modify (1) and interact the family rank, R^F_{it}, with two dummies. D_l (D_s) equals one if a fund belongs to a large (small) family and zero otherwise. We also interact the segment rank, R^S_{it}, with D_l and D_s, respectively. Thereby, we allow for different behavior of managers from large and small families in the segment tournament. We do not have to control for the number of competitors in the segment, since we only use observations from large segments. Our extended regression model reads:

$$\begin{aligned}\Delta\sigma_{it} &= b_l^F R_{it}^F \cdot D_l + b_s^F R_{it}^F \cdot D_s \\ &+ b_l^S R_{it}^S \cdot D_l + b_s^S R_{it}^S \cdot D_s \\ &+ b_1 \Delta\sigma_{it}^m + b_2 \sigma_{it}^{(1)} + \sum_{j=T_1}^{T_2} a_j D_j + e_{it}.\end{aligned} \tag{2}$$

This model allows us to examine simultaneously whether a family tournament exists and whether the tournament behavior differs between large and small families. We use the mean number of competitors of a fund within its family as a cutoff for large families. Families with not less than 26 funds are classified as large families, all others as small ones. Using this cutoff, 50,13% of the funds are categorized as belonging to large families. However, we will show later in this section that our results are not sensitive to a variation of this cutoff.

We expect strategic behavior of funds in small families and non-strategic behavior of funds in large families. Therefore, based on the ideas of Taylor (2003), we expect losers to increase more than winners in the family tournament, if the manager belongs to a large family ($b_l^F < 0$).[10] In small families we expect the opposite behavior ($b_s^F > 0$). As we only examine funds from large segments we expect non-strategic behavior, i.e. we expect losers to increase risk more than winners in the segments tournament ($b_l^S < 0$ and $b_s^S < 0$).[11]

— Please insert TABLE 3 approximately here —

The estimation results of model (2) are presented in Table 3. Our main focus is on the coefficients of the family tournament, b_l^F and b_s^F. The null-hypothesis that the family rank has no impact on risk taking can be rejected at the one percent level (F-statistic 9.44): a family tournament does exist. Fund managers change risk dependent on their interim family rank.

The way in which managers change their risk crucially depends on the size of their family. The coefficient for funds in large families, b_l^F, is negative, i.e. loser funds in large families increase risk more than winner funds do. The opposite is true for funds in small families ($b_s^F > 0$). This confirms our prediction of non-strategic behavior in large families and strategic behavior in small families. The effects we find are not only statistically highly significant, but also economically meaningful. For example, the worst funds from large families increase risk by 1.83 percentage points more than the best funds. This is more than 10% of the average risk of all funds, which is 17.7%.

We also find an influence of the segment rank. The null-hypothesis that there is no influence of the segment rank on risk taking behavior is rejected at the 1%-level (F-statistic = 13.61). The signs of the coefficients b_l^S and b_s^S are both positive and significant. Fund managers behave strategic in the segment tournament. Given that we only look at funds from large segments, we expected negative signs. Furthermore, this result also contradicts empirical evidence presented by Brown, Harlow, and Starks (1996), Koski and Pontiff (1999), and Elton, Gruber, and Blake (2003), who all find non-strategic behavior in the segment tournament. We will turn back to this issue in Section V, where we show that the impact of the segment rank is sample specific and not stable over time.

It is interesting to note that risk adjustment is stronger in large families than in small families, i.e. $|b_l^F| > |b_s^F|$ and $|b_l^S| > |b_s^S|$. The latter difference is significant at the 1%-level. This result suggests that fund managers in large families can adjust risk more freely than fund managers in small families. Possibly, the risk-taking of funds in large families is not as closely monitored as in small families.

The coefficients b_1 and b_2 of our control variables have the expected sign. The positive coefficient b_1 indicates that the risk changing of a fund depends positively on the change in segment volatility. The significantly negative coefficient b_2 indicates mean reversion in the standard deviation. It suggests that fund managers have a target level of risk (see Daniel and Wermers (2000)). Funds with relatively high risk in the first period will therefore tend to decrease their risk and vice versa.

We chose the mean number of competitors a fund has within its family as cutoff for large families. In the following, we examine whether our results are sensitive to this choice in two ways. First, we use several alternative cutoffs (16, 21, 31, and 36 funds). These cutoffs classify between 63.43% and 41.37% of the yearly fund observations as coming from large families. Estimation results for the coefficients b_l^F and b_s^F from model (2) for these cutoffs are presented in Table 4.

— Please insert TABLE 4 approximately here —

We get a negative estimate for b_l^F and a positive estimate for b_s^F for all cutoffs. All but one estimate are significantly different from zero. Thus, our main result is stable with respect to a variation of this cutoff. The coefficient b_l^F becomes larger (in absolute value) when the cutoff increases. This suggests that when choosing a low cutoff some small families are misclassified as large families. Similarly, b_s^F is decreasing for cutoffs larger than 26. In these cases results become weaker because some large families are misclassified as small families.

As a second robustness test we define three groups of funds dependent on the number of competitors in the fund's family. We estimate a regression similar to (2), but interact family ranks with three dummies (D_{small}, D_{medium} and D_{large}) instead of just two. The first group consists of funds with less than 21 competitors in the family (small), the second group of funds with 21-31 competitors (medium), and the third group of funds with more than 31 competitors (large). The results are shown in Table 5.

— Please insert TABLE 5 approximately here —

They confirm our earlier findings. The influence of the family rank for the small-family group is significantly positive, whereas it is significantly negative for the large-family group.

Both coefficients are statistically significant at the 1%-level. In the middle group we find no significant influence, because here large and small families are mixed together. Therefore, in this group some managers behave strategic, while others do not.

IV. Influence of Fund Characteristics

We use a dummy approach to study the family tournament behavior of funds differing with respect to specific fund characteristics. We use two dummies to indicate to which of two groups a fund belongs. If a fund belong to group 1 (e.g. old funds), D_1 equals 1. Accordingly, if the fund belongs to group 2 (e.g. young funds), D_2 equals 1. The dummies equal zero, if the fund does not belong to the respective group. Our model then reads:

$$\begin{aligned}\Delta\sigma_{it} &= b^F_{l,1}R^F_{it}\cdot D_l\cdot D_1 + b^F_{l,2}R^F_{it}\cdot D_l\cdot D_2 \\ &+b^F_{s,1}R^F_{it}\cdot D_s\cdot D_1 + b^F_{s,2}R^F_{it}\cdot D_s\cdot D_2 \\ &+b^S_{l,1}R^S_{it}\cdot D_l\cdot D_1 + b^S_{l,2}R^S_{it}\cdot D_l\cdot D_2 \\ &+b^S_{s,1}R^S_{it}\cdot D_s\cdot D_1 + b^S_{s,2}R^S_{it}\cdot D_s\cdot D_2 \\ &+b_1\Delta\sigma^m_{it} + b_2\sigma^{(1)}_{it} + \sum_{j=T_1}^{T_2} a_j D_j + e_{it}.\end{aligned} \tag{3}$$

This allows us to study whether the tournament behavior of funds belonging to group 1 differs from the behavior of funds belonging to group 2. In the remainder of this section we show that our main results hold for all groups of funds: first, there is a family tournament. Second, funds in small families behave strategic ($b^F_{l,1} > 0$, $b^F_{l,2} > 0$) and funds in large families behave non-strategic ($b^F_{s,1} < 0$, $b^F_{s,2} < 0$).

A. Old vs. Young Funds

In this section we analyze the impact of the fund's age on the behavior in the family tournament. We distinguish between young and old funds. We set the dummy D_1 in model (3) equal to one if the fund's age is above the median age, and equal to zero otherwise. Accordingly, we set D_2 equal to one if the fund is not older than the median fund, and equal to zero otherwise.

— Please insert TABLE 6 approximately here —

Panel A of Table 6 shows that fund age does not influence the risk taking behavior in the family tournament. What matters is whether a fund belong to a large family or not. We find $b^F_{l,1} < 0$ and $b^F_{l,2} < 0$, i.e. funds in large families behave non-strategic no matter how old they are. In contrast, funds in small families all behave strategic ($b^F_{s,1} > 0$ and $b^F_{s,2} > 0$).

In the segment tournament the behavior of the funds also does not depend on their age. Old and young funds from large and small families all behave strategic. We do not report results for the segment tournament here and in the following tables for the sake of brevity. Coefficients are always positive and usually significant at the 1% or 5%-level. The influence of the other control variables also does not change.

B. Large vs. Small Funds

In this section we examine the question, whether the behavior of funds depends on their size. We again estimate model (3). Now D_1 (D_2) equals one, if the size of a fund is above (not above) the median size, and zero otherwise. Estimation results are presented in Panel B of Table 6.

We find that funds from large families behave different from funds from small families - no matter how big the funds are. The difference in the risk-taking behavior between large and small families is not due to difference in the size of funds from large and small families.

C. High vs. Low Turnover Funds

In this section we examine whether the risk taking behavior of funds depends on the funds' trading activity. Trading activity is measured by the turnover rate of the fund. We now set D_1 (D_2) in model (3) equal to one, if the turnover rate of the fund is above (not above) the median turnover rate, and zero otherwise. Results are presented in Panel C of Table 6.

We find strategic behavior in small families and non-strategic behavior in large families. The result holds for funds with high turnover rates and for funds with low turnover rates. All coefficients of the family tournament are significant and of the expected sign. The behavior of funds in the family tournament is not driven by the level of their trading activity.

D. Single vs. Multiple Class Funds

There are different organizational structures for mutual funds. While many mutual funds offer different share classes with different fee structures that are backed by the same portfolio, others only offer one share class. In this section, we compare the risk-taking behavior of single class and multiple class funds. We set D_1 (D_2) equal to one if the fund is a single class (multiple class) fund, and zero otherwise. The estimation results presented in Panel D of Table 6 show that there is no difference in the behavior of single and multiple class funds.

E. No-Load vs. Load Funds

We now study whether the risk-taking behavior of fund depends on its load status. To get a clear picture of the influence of the load status, we concentrate on single share class funds.[12] This reduces our number of fund year observations to 4,287. We run model (3) as above, where D_1 (D_2) now equals one if the fund is a no-load fund (load fund), and zero otherwise. Estimation results from this regression are presented in Panel E of Table 6. Our results show that funds behave non-strategic in large families and strategic in small families. We can conclude that our results are not driven by the load-status of the funds we examine.

F. High Expense vs. Low-Expense Funds

Finally, we examine differences in the behavior of funds in the family tournament between funds with high and low expense ratios. For the same reason as in the last section, we concentrate on single share class funds.[13] We now set D_1 (D_2) equal to one, if the fund's expense ratio is above (not above) the median expense ratio, and zero otherwise. Estimation results are presented in Panel F of Table 6. Again, the funds' characteristics have no impact on the funds' behavior in the family tournament.

Overall, the results lend strong support to our argument, that the competitive situation in the family as measured by the number of funds in the family drives funds' behavior. The difference in the behavior of funds from large and small families is not driven by other fund characteristics.

V. Temporal Stability

We conduct two tests to explore the temporal stability of our results. First, we run yearly regressions. Results are presented in Panel A of Table 7.

— Please insert TABLE 7 approximately here —

Despite the large amount of noise in yearly regressions, we find at least one significant coefficient for the family tournament in each year. All significant coefficients have the expected sign.

To get less noisy estimates, we conduct rolling three-year regressions as a second test. Results are presented in Panel B of Table 7. For the family tournament, all coefficients of the sub-periods are of the expected signs and most of them are significant. The behavior of fund managers in the family tournament is very stable over time.

Turning to the coefficients from the segment tournament in Panels A and B of Table 7, we find altering coefficients. Whereas the results from the earlier years of the sample indicate non-strategic behavior in many cases, we find strong evidence for strategic behavior in the later years. If we restrict our analysis to the first half of our sample (1993-1996), the overall influence of the segment rank is negative (results not reported). Thereby, we are able to reproduce the results of earlier studies like, e.g., Brown, Harlow, and Starks (1996) and Elton, Gruber, and Blake (2001). In the later years 1997-2001, the coefficient becomes significantly positive. These later years also drive our results for the whole sample in Table 3. There is a dramatic change in the behavior of fund managers in the segment tournament. This suggests that the behavior of fund managers in the segment tournament is sample-specific, while the behavior in the family tournament is not.

VI. Conclusion

In this paper, we study the intra-firm competition of fund managers. Our first main result is that funds compete against other funds of their own company for the best rank in the fund family. This offers a novel view on fund families. Funds of a family should not be viewed as coordinated entities as assumed in the literature so far (see, e.g., Mamaysky and Spiegel

(2002), or Gaspar, Massa, and Matos (2004)), but rather as competitors in an intense intra-firm competition. They engage in a family tournament by adapting their risk dependent on their interim rank within their family.

Our second result is that the risk taking behavior of funds depends on the competitive situation they face. Midyear losers from large families increase risk more than winners do. In small families the opposite behavior is observed: midyear winners increase risk more than losers do. This suggest that strategic interaction takes place in small fund families, but not in large ones. Furthermore, the risk adjusting behavior of fund managers is more pronounced in large families than in small families. This suggests less restrictive monitoring of fund managers' risk taking behavior in large families.

Our results are remarkable robust. They hold for funds of different age, size, trading activity, organizational structure, load status and expense ratios. They also hold for varying time period.

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Notes

[1]A fund family includes all funds managed by the same fund management company (e.g. *Janus* or *Fidelity*). Over 80% of all funds belong to multi-fund families.

[2]A notable exception is the case of an extremely bad position since this entails the threat of dismissal (see, e.g., Khorana (1996), and Chevalier and Ellison (1999)). For a model where employment risk drives the behavior of fund managers see Hu, Kale, and Subramaniam (2003).

[3]A segment is defined as the entirety of funds having comparable investment objectives, e.g. Growth or Health Sector. The risk taking behavior of funds in dependence on their relative position in their segment (segment tournament) has been studied extensively in the literature. The seminal paper is Brown, Harlow, and Starks (1996), who find that midyear-losers increase risk more than midyear winners (i.e. non-strategic behavior in the segment tournament). Similar results are also reported by Orphanides (1996), Koski and Pontiff (1999), Elton, Gruber, and Blake (2003), and Qiu (2003) for mutual funds and by Brown, Goetzmann, and Park (2001) and Agarwal, Daniel, and Naik (2003) for commodity trading advisors and hedge fund managers, respectively.

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

[5]Patel, Zeckhauser, and Hendricks (1994) show that investors care more about raw returns rather than risk-adjusted measures and more about rankings rather than absolute performance.

[6]We also use the difference of the risk ratios $(\sigma_{it}^{(2)}/\sigma_{it}^{m(2)}) - (\sigma_{it}^{(1)}/\sigma_{it}^{m(1)})$ as dependent variable. The results are very similar to those reported in the paper.

[7] We also run our regressions taking 6 months instead of 7 months as the first part of the year. The general results are unchanged, but the effects show up more clearly in the (7,5) specification than in the (6,6) specification.

[8]We also use the respective mean fund instead of the median to calculate the proxies for the change in segment risk. Our results are not affected by this.

[9]We will discuss the results for the control variables in the next section, where we estimate our fully developed model.

[10]Although the Taylor (2003) model is set up as a two-person model, the intuition carries over to a multi-person setting.

[11]Our hypothesis are now that the coefficients are either greater than zero (in those cases where we expect strategic behavior) or smaller than zero (when we expect non-strategic behavior) rather than just different from zero. We therefore apply one-sided t-tests to determine the significance-levels.

[12]Results are very similar if we aggregate the TNA weighted loads of all share classes and then compare the group of funds with loads above the median to those below the median load.

[13]Results are very similar if we aggregate the TNA weighted expenses of all share classes and then compare the group of funds with expenses above the median to those below the median expense ratio.

Table 1
Summary Statistics

This table presents summary statistics on US equity mutual funds. Column 2 presents the total number of funds in our sample. In Column 3 the number of families is shown and Column 4 presents the mean sum of the total net asset values (TNA) of all funds in a family. TNAs are in million USD.

Year	Number of Funds	Number of Families	Mean Family TNA
1993	1175	238	3,049
1994	1439	260	3,267
1995	1821	270	4,487
1996	2122	278	5,856
1997	2598	297	7,429
1998	2975	319	8,620
1999	3302	336	10,844
2000	3459	381	9,178
2001	3865	383	8,271

Table 2
Influence of the Family Rank on Funds' Risk Taking

This table contains estimates from a pooled regression. We estimate model (1) from the main text. Funds from the segments Growth, Growth & Income, and Small Company Growth are examined for the years 1993 to 2001. The dependent variable is the fund's change of risk between the first and second part of a year. It is measured as the annualized standard deviation of a fund's monthly returns in the second part of the year less that of the first part of the year. The independent variables are the rank of this fund in its family, R_{it}^F, and in its segment, R_{it}^S, the change in segment volatility $\Delta\sigma_{it}^m$, the risk of the fund in the first part of the year, $\sigma_{it}^{(1)}$, and yearly dummies (estimates not reported). t-values are reported in parentheses. ***, ** and * indicate significance at the one, five and ten percent level (two-tailed tests), respectively. The number of observations is 10,321 and the centered R^2 is 72.17%.

Independent Variable	Description of Independent Variable	Estimated Coefficient
R_{it}^F	family rank	0.0059^{**}
		(2.4011)
R_{it}^S	segment rank	0.0110^{***}
		(4.0450)
$\Delta\sigma_{it}^m$	change in segment volatility	0.8359^{***}
		(30.0342)
$\sigma_{it}^{(1)}$	fund's risk in first part of year	-1.1837^{***}
		(-55.4950)

Table 3
Risk Taking in Large and Small Fund Families

This table contains estimates from a pooled regression. We estimate model (2) from the main text. Funds from the segments Growth, Growth & Income, and Small Company Growth are examined for the years 1993 to 2001. The dependent variable is the fund's change of risk between the first and second part of a year. It is measured as the annualized standard deviation of a fund's monthly returns in the second part of the year less that of the first part of the year. The independent variables are the rank of this fund in its family, R_{it}^F, and in its segment, R_{it}^S, the change in segment volatility $\Delta\sigma_{it}^m$, the risk of the fund in the first part of the year, $\sigma_{it}^{(1)}$, and yearly dummies (estimates not reported). R_{it}^F and R_{it}^S are interacted with either D_l or D_s, respectively. D_l (D_s) equals one if a fund belongs to a large (small) family, and zero otherwise. A family is classified as large, it the number of funds in the family is not smaller than the median number (i.e. 26). t-values are reported in parentheses. ***, ** and * indicate significance at the one, five and ten percent level (one-tailed tests), respectively. The number of observations is 10,321 and the centered R^2 is 72.22%.

Independent Variable	Description of Independent Variable	Estimated Coefficient
$R_{it}^F \cdot D_l$	family rank in large families	-0.0183^{***}
		(-2.5512)
$R_{it}^F \cdot D_s$	family rank in small families	0.0092^{***}
		(3.5422)
$R_{it}^S \cdot D_l$	segment rank in large families	0.0332^{***}
		(4.3561)
$R_{it}^S \cdot D_s$	segment rank in small families	0.0089^{***}
		(3.1337)
$\Delta\sigma_{it}^m$	change in segment volatility	0.8363^{***}
		(30.0690)
$\sigma_{it}^{(1)}$	fund's risk in first part of year	-1.1837^{***}
		(-55.5036)

Table 4
Different Cutoffs for Large/Small Families

This table contains estimates of b_l^F and b_s^F from model (2) as shown in the main text for different cutoffs for large families. Funds from the segments Growth, Growth & Income, and Small Company Growth are examined for the years 1993 to 2001. The dependent variable in all regressions is the fund's change of risk between the first and second part of a year. It is measured as the annualized standard deviation of a fund's monthly returns in the second part of the year less that of the first part of the year. The independent variables are the rank of this fund in its family, R_{it}^F, and in its segment, R_{it}^S, the change in segment volatility $\Delta\sigma_{it}^m$, the risk of the fund in the first part of the year, $\sigma_{it}^{(1)}$, and yearly dummies (estimates not reported). In Panel A R_{it}^F and R_{it}^S are interacted with either D_l or D_s, respectively. D_l (D_s) equals one if a fund belongs to a large (small) family, and zero otherwise. A family is classified as large, it the number of funds in the family is not smaller than 16 (Panel A), 21 (Panel B), 31 (Panel C) or 36 (Panel D), respectively. The last column presents the number of observations in each group. The last row contains the centered R^2. The number of observations in all regressions is 10,321. t-values are reported in parentheses. ***, ** and * indicate significance at the one, five and ten percent level (one-tailed tests), respectively.

Panel A: 16 as Cutoff

Independent Variable	Description of Independent Variable	Estimated Coefficient	Number of Observations
$R_{it}^F \cdot D_l$	family rank in families with $\geq$ 16 funds	-0.0017 (-0.3156)	6,443
$R_{it}^F \cdot D_s$	family rank in families with $<$ 16 funds	0.0075^{***} (2.7633)	3,878
R^2		72.18%	

Panel B: 21 as Cutoff

Independent Variable	Description of Independent Variable	Estimated Coefficient	Number of Observations
$R_{it}^F \cdot D_l$	family rank in families with $\geq$ 21 funds	-0.0121^{**} (-1.8428)	5,730
$R_{it}^F \cdot D_s$	family rank in families with $<$ 21 funds	0.0087^{***} (3.3435)	4,591
R^2		72.19%	

Table 4
(continued)

Panel C: 31 as Cutoff

Independent Variable	Description of Independent Variable	Estimated Coefficient	Number of Observations
$R_{it}^F \cdot D_l$	family rank in families with ≥ 31 funds	-0.0195^{***}	4,708
		(-2.2713)	
$R_{it}^F \cdot D_s$	family rank in families with < 31 funds	0.0084^{***}	5,613
		(3.2977)	
R^2		72.21%	

Panel D: 36 as Cutoff

Independent Variable	Description of Independent Variable	Estimated Coefficient	Number of Observations
$R_{it}^F \cdot D_l$	family rank in families with ≥ 36 funds	-0.0251^{***}	4,270
		(-2.5883)	
$R_{it}^F \cdot D_s$	family rank in families with < 36 funds	0.0081^{***}	6,051
		(3.2022)	
R^2		72.21%	

Table 5
Three Family-Size Groups

This table contains estimates of b_l^F and b_s^F from model (2) as shown in the main text for three groups of funds according to family size. Funds from the segments Growth, Growth & Income, and Small Company Growth are examined for the years 1993 to 2001. The dependent variable in all regressions is the fund's change of risk between the first and second part of a year. It is measured as the annualized standard deviation of a fund's monthly returns in the second part of the year less that of the first part of the year. The independent variables are the rank of this fund in its family, R_{it}^F, and in its segment, R_{it}^S, the change in segment volatility $\Delta\sigma_{it}^m$, the risk of the fund in the first part of the year, $\sigma_{it}^{(1)}$, and yearly dummies (estimates not reported). R_{it}^F and R_{it}^S are multiplied with either D_{small}, D_{medium} or D_{large}, which take on the value one if a fund has less than 21, between 21 and 30, or more than 30 competitors within its family, respectively. The last column presents the number of observations in each group. The last row contains the centered R^2. The number of observations in all regressions is 10,321. t-values are reported in parentheses. ***, ** and * indicate significance at the one, five and ten percent level (one-tailed tests), respectively.

Independent Variable	Description of Independent Variable	Estimated Coefficient	Number of Observations
$R_{it}^F \cdot D_{large}$	family rank in families	-0.0194^{***}	4,708
	with ≥ 31 funds	(-3.3421)	
$R_{it}^F \cdot D_{medium}$	family rank in families	0.0005	1,022
	with ≥ 21 and < 31 funds	(0.9585)	
$R_{it}^F \cdot D_{small}$	family rank in families	0.0088^{***}	4,591
	with < 21 funds	(3.3421)	
R^2		72.21%	

Table 6
Influence of Fund Characteristics

This table contains estimation results from model (3) as shown in the main text. Funds from the segments Growth, Growth & Income, and Small Company Growth are examined. The dependent variable in all regressions is the fund's change of risk between the first and second part of a year. It is measured as the annualized standard deviation of a fund's monthly returns in the second part of the year less that of the first part of the year. The independent variables are the rank of this fund in its family, R_{it}^F, and in its segment, R_{it}^S, the change in segment volatility $\Delta\sigma_{it}^m$, the risk of the fund in the first part of the year, $\sigma_{it}^{(1)}$, and yearly dummies (estimates not reported). In all panels R_{it}^F and R_{it}^S are interacted with either D_l or D_s, respectively. D_l (D_s) equals one if a fund belongs to a large (small) family, and zero otherwise. A family is classified as large, it the number of funds in the family is not smaller than the median number (i.e. 26). These variables are additionally interacted with either D_1 or D_2. In Panel A, D_1 (D_2) equals one, if a fund's age is above (not above) the median age, and zero otherwise. In Panel B, D_1 (D_2) equals one, if a fund's size is above (not above) the median size, and zero otherwise. In Panel C, D_1 (D_2) equals one, if a fund's turnover rate is above (not above) the median turnover rate, and zero otherwise. In Panel D, D_1 (D_2) equals one, if a fund is a single class (multi class) fund, and zero otherwise. In Panel E, D_1 (D_2) equals one, if a fund is a no-load (load) fund, and zero otherwise. In Panel F, D_1 (D_2) equals one, if a fund's expense ratio is above (not above) the median expense ratio, and zero otherwise. The regressions in Panel E and F are run on the subsample which consists only of single share class funds. The number of observations in Panels A to D is 10,321 in Panels A to D and 4,287 in Panels E and F. The last column contains the number of observations for the different combinations of large/small families and individual fund characteristics. t-values are reported in parentheses. ***, ** and * indicate significance at the one, five and ten percent level (one-tailed tests), respectively. The last column contain the centered R^2.

Panel A: Old vs. Young Funds

Independent Variable	Description of Independent Variable	Estimated Coefficient	Number of Observations
$R_{it}^F \cdot D_l \cdot D_1$	family rank in large families for old funds	-0.0195^{**} (-1.7132)	1,408
$R_{it}^F \cdot D_l \cdot D_2$	family rank in large families for young funds	-0.0168^{**} (-1.7749)	2,075
$R_{it}^F \cdot D_s \cdot D_1$	family rank in small families for old funds	0.0075^{**} (1.9966)	3,019
$R_{it}^F \cdot D_s \cdot D_2$	family rank in small families for young funds	0.0104^{***} (2.9513)	3,819
R^2		72.24%	

Table 6
(continued)

Panel B: Large vs. Small Funds

Independent Variable	Description of Independent Variable	Estimated Coefficient	Number of Observations
$R_{it}^F \cdot D_l \cdot D_1$	family rank in large families for large funds	-0.0244^{***} (-2.5067)	1,908
$R_{it}^F \cdot D_l \cdot D_2$	family rank in large families for small funds	-0.0066 (-0.5977)	1,575
$R_{it}^F \cdot D_s \cdot D_1$	family rank in small families for large funds	0.0149^{***} (3.7589)	3,252
$R_{it}^F \cdot D_s \cdot D_2$	family rank in small families for small funds	0.0051^{*} (1.5135)	3,586
R^2		72.26%	

Panel C: High vs. Low Turnover Funds

Independent Variable	Description of Independent Variable	Estimated Coefficient	Number of Observations
$R_{it}^F \cdot D_l \cdot D_1$	family rank in large families for high turnover funds	-0.0165^{*} (-1.5394)	1,712
$R_{it}^F \cdot D_l \cdot D_2$	family rank in large families for low turnover funds	-0.0179^{**} (-1.8097)	1,771
$R_{it}^F \cdot D_s \cdot D_1$	family rank in small families for high turnover funds	0.0126^{***} (3.2542)	3,126
$R_{it}^F \cdot D_s \cdot D_2$	family rank in small families for low turnover funds	0.0061^{**} (1.7955)	3,712
R^2		72.22%	

Table 6
(continued)

Panel D: Single Class vs. Multiple Class Funds

Independent Variable	Description of Independent Variable	Estimated Coefficient	Number of Observations
$R^F_{it} \cdot D_l \cdot D_1$	family rank in large families	-0.0232^*	1,075
	for single class funds	(-1.6250)	
$R^F_{it} \cdot D_l \cdot D_2$	family rank in large families	-0.0172^{**}	2,408
	for multiple class funds	(-2.0141)	
$R^F_{it} \cdot D_s \cdot D_1$	family rank in small families	0.0119^{***}	3,212
	for single class funds	(3.5001)	
$R^F_{it} \cdot D_l \cdot D_2$	family rank in small families	0.0054^*	3,626
	for multiple class funds	(1.3669)	
R^2		72.23%	

Panel E: No-Load vs. Load Funds

Independent Variable	Description of Independent Variable	Estimated Coefficient	Number of Observations
$R^F_{it} \cdot D_l \cdot D_1$	family rank in large families	-0.0308^{**}	744
	for no-load funds	(-1.8136)	
$R^F_{it} \cdot D_l \cdot D_2$	family rank in large families	-0.0069	331
	for load funds	(-0.2642)	
$R^F_{it} \cdot D_s \cdot D_1$	family rank in small families	0.0105^{***}	2,487
	for no-load funds	(2.6558)	
$R^F_{it} \cdot D_s \cdot D_2$	family rank in small families	0.0180^{***}	725
	for load funds	(2.6518)	
R^2		71.47%	

Table 6
(continued)

Panel F: High Expense vs. Low Expense Funds

Independent Variable	Description of Independent Variable	Estimated Coefficient	Number of Observations
$R_{it}^F \cdot D_l \cdot D_1$	family rank in large families for high expense funds	-0.0395^* (-1.5884)	335
$R_{it}^F \cdot D_l \cdot D_2$	family rank in large families for low expense funds	-0.0164 (-0.9425)	740
$R_{it}^F \cdot D_l \cdot D_1$	family rank in small families for high expense funds	0.0059^* (1.3864)	1,786
$R_{it}^F \cdot D_s \cdot D_2$	family rank in small families for low expense funds	0.0227^{***} (4.0561)	1,426
R^2		74.86%	

Table 7
Temporal Stability of Results

This table contains estimates from regressions for yearly subsamples for each year 1993-2001 (Panel A) as well as rolling 3-year pooled regressions (Panel B). Funds from the segments Growth, Growth & Income, and Small Company Growth are examined. The dependent variable in all regressions is the individual fund's change of risk between the first and second part of a year measured as the annualized standard deviation of a fund's monthly returns in the second part of the year less that of the first part of the year. The independent variables are the rank of this fund in its family, R_{it}^F, and in its segment, R_{it}^S, the change in segment volatility $\Delta\sigma_{it}^m$, the risk of the fund in the first part of the year, $\sigma_{it}^{(1)}$, and yearly dummies (estimates not reported). R_{it}^F and R_{it}^S are interacted with either D_l or D_s, respectively. D_l (D_s) equals one if a fund belongs to a large (small) family, and zero otherwise. A family is classified as large, it the number of funds in the family is not smaller than the median number (i.e. 26). t-values are reported in parentheses. ***, ** and * indicate significance at the one, five and ten percent level (one-tailed tests), respectively. The last two columns contain the number of observations N and the centered R^2.

Panel A: Yearly Regressions

Year	$R_{it}^F \cdot D_l$	$R_{it}^F \cdot D_s$	$R_{it}^S \cdot D_l$	$R_{it}^S \cdot D_s$	N	R^2
1993	−0.0451**	0.0045	0.0685***	0.0272***	604	39.05%
	(−1.9241)	(0.8967)	(3.0138)	(4.6015)		
1994	−0.0119	0.0079**	-0.0031	-0.0229***	707	24.58%
	(−0.4177)	(2.3023)	(-0.1076)	(-5.5636)		
1995	0.0122	0.0057*	-0.0187	-0.0058*	842	67.79%
	(0.6384)	(1.4671)	(-0.9638)	(-1.2861)		
1996	−0.0164	0.0075*	0.0138	-0.0122**	933	62.77%
	(−0.6321)	(1.4205)	(0.5272)	(2.0376)		
1997	−0.0181*	-0.0054	0.0401***	0.0203***	1137	69.88%
	(−1.4715)	(-1.1494)	(3.0990)	(3.9185)		
1998	−0.0021	0.0135**	0.0598***	0.0403***	1316	13.17%
	(−0.0954)	(1.7198)	(2.5748)	(4.6363)		
1999	−0.0476**	0.0126*	0.0582***	0.0071	1479	5.45%
	(−2.1496)	(1.3357)	(2.4755)	(0.6880)		
2000	−0.0321*	0.0193**	0.0438**	-0.0009	1564	41.98%
	(−1.4432)	(1.9434)	(1.8976)	(-0.0920)		
2001	0.0051	0.0125**	0.0393***	0.0339***	1739	45.69%
	(0.4148)	(2.0098)	(2.8744)	(4.6132)		

Table 7
(continued)

Panel B: Rolling Three-Year Regressions

Years	$R_{it}^F \cdot D_l$	$R_{it}^F \cdot D_s$	$R_{it}^S \cdot D_l$	$R_{it}^S \cdot D_s$	N	R^2
1993-1995	-0.0278^{**}	0.0072^{***}	0.0200^{*}	-0.0098***	2153	47.68%
	(-2.0172)	(2.8709)	(1.4478)	(3.4060)		
1994-1996	-0.0112	0.0077^{***}	-0.0016	-0.0200***	2482	62.08%
	(-0.7757)	(2.9563)	(-0.1112)	(-6.7269)		
1995-1997	-0.0131^{*}	0.0042^{*}	0.0157^{*}	-0.0035	2912	68.26%
	(-1.2874)	(1.5141)	(1.4869)	(-1.1197)		
1996-1998	-0.0006	0.0067^{*}	0.0262^{**}	0.0170***	3386	87.42%
	(-0.0500)	(1.6136)	(1.9647)	(3.6905)		
1997-1999	-0.0155	0.0074^{*}	0.0420^{***}	0.0216***	3932	80.61%
	(-1.2438)	(1.5248)	(3.1958)	(4.0825)		
1998-2000	-0.0314^{***}	0.0163^{***}	0.0548^{***}	0.0133**	4359	72.87%
	(-2.3761)	(3.0098)	(3.9590)	(2.2605)		
1999-2001	-0.0211^{**}	0.0150^{***}	0.0395^{***}	0.0093**	4782	36.59%
	(-1.9752)	(3.0428)	(3.4791)	(1.7494)		

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