Family Values and the Star Phenomenon

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Abstract:

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We examine the extent to which a fund's cash flows are affected by the stellar performance of other funds in its fund family – and the consequences of such spillover effects. The cash flow response to individual fund performance has been shown to be asymmetric (convex), suggesting a disproportionate benefit from a 'star' performance. We document a strong positive spillover from a star performance, resulting in greater cash inflow not only to the star fund but to other funds in the family as well. We argue that the existence of such spillovers may induce lower ability families to pursue a star creating strategy by implementing high variation investment strategies across its funds. On the other hand, higher ability families, with sharing of information and strategy among their funds, are likely to have more correlated performance across funds. We find evidence that some families have superior investment skills as indicated by their future performance. These are families that produce stars, despite a lower ex-ante probability of doing so. The evidence also indicates that lower ability families tend to pursue star creating strategies.

'Sure, fund ads dutifully warned that prices could go down as well as up, but only winning funds are ever promoted.'

— BusinessWeek, 12/17/2001

'..January 2000, Strong Enterprise Fund touted its 147.8 % gain under a feisty two-word headline: "Any Questions"'

— Jonathan Clements, Wall St. Journal, 11/20/2001

1 Introduction

Most mutual funds are members of fund families.[1] There are good reasons for this. A family structure brings economies of scale to the distribution, servicing, and promotion of funds. Compared to stand alone funds, a family has greater flexibility in reallocating its human and other resources in response to market opportunities. A family's reputation can help to reassure investors about the selection and monitoring of investment managers.[2]

Despite the prevalence of the family organization, little research has been done on the consequences or importance of family membership. The literature has, for the most part, treated funds as though they were stand alone entities. This is inappropriate if there are significant spillover effects between funds in a family – *e.g.,* if good performance by a fund enhances cash inflow to other funds in the family as well. Such spillovers may be generated if, for instance, fund families actively publicize the performance of their best performing funds to promote visibility and, thereby, attract greater cash inflow.[3] Without an understanding of performance and strategy at the level of the fund family, we are potentially ignoring significant influences on the behavior and performance of individual funds as well.

[1] Over 80% of mutual funds are members of fund families. The average fund family has about 7 diversified equity funds (see Table I).

[2] There could be a downside as well. For instance, a large family may tend to become bureaucratic and less responsive to new opportunities.

[3] An alternative explanation may be that investors drawn to a star fund may find it cost effective to diversify by investing in other funds in the family.

It is well documented in the literature that investors appear to respond asymmetrically to the performance of a fund.[4] A strongly performing fund attracts a disproportionate inflow of funds, relative to the cash outflow when performance is poor. While the reasons for such a pattern are not well understood,[5] the convex (call-option-like) response to fund performance suggests a disproportionate benefit from a star performance. When funds are in a family structure, positive spillover effects between funds can further amplify the benefit of a star performer. As a consequence, families with lower ability may be more inclined to follow investment strategies that raise the odds of creating a star – even if a few 'dogs' are created in the process. Of course, enthusiasm for a star performer would be considerably diminished if, for instance, the bulk of the new money a star fund attracted were cannibalized from other funds in its family. On the other hand, it may be optimal for higher ability families to devise investment strategies to maximize their comparative advantage in investing and information acquisition – rather than pursuing a star creating strategy that devalues their investment skills.

We investigate the question of whether there are intra-family spillover effects and, specifically, whether a star performer affects the flow of new money, to itself and to other funds in the family. For our empirical analysis, we use open-end mutual fund data from Center for Research in Security Prices (CRSP) for the post-1991 period, for which information on family identity is available. Consistent with much of the existing research, we consider only diversified U.S. equity funds. We also expect the spillover effect to be most evident for this class of funds. For our analysis, unless specified otherwise, we define a star fund as one with a Fama-French three-factor adjusted performance that ranks among the top 5 percent of performances in the previous 12

[4] The non-linearity of the cash flow response to fund performance is documented in several studies. These are discussed in section 2 on related literature.

[5] One may need a less than fully rational explanation to account for such a cash flow response pattern. For instance, the pattern may reflect the difficulty of attracting the attention of small, possibly unsophisticated fund investors unless the fund is a star performer and is heavily promoted. On the other hand, if the fund does poorly, investor reaction may be muted since the family has no incentive to publicize its poor performance. The asymmetric reaction may also result from investor aversion to recognizing losses, in line with behavioral evidence on the reluctance of investors to sell losing stocks. For behavioral evidence on fund investors, see Goetzmann and Peles (1997).

months. Alternative definitions of star funds are, however, also considered.

Our results confirm that there is a strong positive spillover effect from having a star performer in the family. Overall, the new money growth for star families (families with at least one star fund in the preceding 12 months) is significantly higher than that for families with no stars. Compared to a stand alone star fund, a star performance in a family with 7 member funds (mean family size in 1998) delivers an aggregate cash flow increase that is more than 3 times larger.[6] Our finding is consistent with the empirical evidence in Khorana and Servaes (2000) that the presence of a star fund has a positive and significant impact on fund family market share.

The spillover results are robust to alternative models of risk adjustment and various definitions of a star performance, including the use of market-adjusted returns and raw returns to identify a star fund. We also investigate the spillover effect when a 'dog' is present - defined as a fund performing among the bottom 5 percent of funds. Our analysis indicates that while there is a negative effect on the cash flows to a dog fund, there is no significant impact on the cash flows to other funds in the family or to the family overall. These results are consistent with there being an asymmetric investor response to star versus dog performances.

We also examine the spillover effect using a star fund definition that is best known in the mutual fund industry: the 5-star rated Morningstar funds (henceforth, MS stars). A 5-star rating indicates a stellar performance. Like the star rankings we construct, the Morningstar ratings are based on risk-adjusted past performance. Nevertheless, the Morningstar ratings differ from the previously defined star ranking system in mainly three aspects: 1) Morningstar uses a different risk-adjustment method; 2) Morningstar ratings take into account load charges; and 3) Morningstar ratings are based on the long-term past performance (past 10-year, 5-year and 3-year returns). As a consequence, the MS stars are quite different from the stars identified by the

[6]We find that, controlling for other variables, a star fund itself attracts 12.48% more new money on an annual basis than other funds. In addition, the magnitude of the spillover effect associated with a star performance is 4.44% on an annual basis. Assuming that funds have similar sizes, the total new money growth for a star family with 7 member fund is given by $12.48\% + 6 * 4.44\% = 39.12\%$, which is more than 3 times the increase in new money growth for a stand alone star fund.

factor models. Nevertheless, our empirical results suggest that having an MS star in the family generates a spillover effect similar to what we find with the stars defined by the factor models. Moreover, the impact of the (longer-term) MS stars is largely independent of the impact of the (one-year) factor-model stars.

Does the existence of such spillovers affect investment strategy and other decisions made by a fund family? Our conjecture is that disproportionate cash flows to a star family might induce some, especially families of lower ability, to pursue a star creating strategy. To raise the odds of producing extreme returns, a family can reasonably control two factors (at least over the long run): a higher cross-fund return standard deviation and a greater number of funds in the family. The results of our logistic regression indicate that the probability of creating a star fund is most consistently affected by cross-fund return standard deviation. The impact of number of funds on the probability of creating star funds is shown to be positive (as predicted) but less significant. Interestingly, the logistic regression indicates that increasing the variance in the cross-fund investment strategies does not help create the longer-term MS stars. As we might expect, the star creating strategy of adopting higher cross-fund variance investments is more effective and relevant in creating short-term stars.

We then examine whether a strategy of chasing star families benefits investors. While stars may be associated with investment ability, they may also be, as discussed, the result of lower ability families pursuing star creating strategies. To examine the returns from a star chasing strategy, we employ a portfolio performance approach. We find that families with star performers in a particular period do not have higher returns in the subsequent period. Hence, stars do not, on average, indicate investment ability, and a naive strategy of pursuing star families does not benefit investors. Our next step is to examine fund performance conditional on family characteristics that are related to the probability of creating star funds.

Families, depending on investment strategy and number of funds, differ in the ex-ante probability of producing a star performance – irrespective of investment ability. Hence, conditional on a star performance, the performance will be a better indicator of ability when the family has a low ex-ante probability of producing stars, so long as some families have superior investment ability.[7] Based on family characteristics that have a significant influence on the probability of producing a star, we form portfolios based on cross-fund return standard deviation and number of funds for both star and non-star families. Only one of these portfolios, the low standard deviation-small size star portfolio, displays positive excess returns. Thus, there is evidence that at least some families appear to have superior ability – these are star families with low ex-ante probability of producing a star.

The next question we address is whether fund families deliberately choose investment strategies to affect the ex-ante probability of producing a star. Lower ability families may have, as discussed, a greater incentive to choose variance increasing strategies in order to generate stars. On the other hand, families with higher investment ability are more likely to share information and strategy among member funds, resulting in lower cross-fund return standard deviation. To investigate this issue we examine the relative performance of higher and lower standard deviation families. Our finding is that, for both star and non-star families, higher standard deviation families significantly underperform their lower standard deviation counterparts in the subsequent year. This is consistent with the view that lower ability families are also more likely to adopt a variance increasing strategy, resulting in higher standard deviation in cross-fund returns. Unlike standard deviation, there is no significant difference in the overall performance of families with small number of funds compared to families with a larger number of funds. Our results indicate that investment strategies that are effective in generating stars are also the ones associated with a lower average performance. Hence, a star creating strategy, presumably targeted to the less informed

[7]For illustration consider a situation in which, unconditionally, a family has a small probability, say 1%, of having superior investment ability. Families with superior ability produce stars with a probability of 50%. However, there are two types of families. In one type, families with no investment ability have a high ex-ante probability, say 10%, of producing a star fund. In the other type, families with no ability have a low ex-ante probability, say 2%, of producing a star fund. Using Bayes' rule it follows that, conditional on a star performance, a family from the high ex-ante probability group has a low posterior probability of having superior ability (about 5%). On the other hand, a star family from the low ex-ante probability group has a much greater posterior probability of having investment ability (about 20%).

investors, does them no favor.

There are policy implications of a general nature stemming from the findings in the paper. To discourage fund families from following star creating strategies, at the expense of less sophisticated investors, more disclosure can help. For instance, fund families could be required to disclose features of their overall performance, in addition to any other information that is publicized. Naturally, this would include information on merged and defunct funds.

The rest of the paper is as follows. In section 2, we discuss the extensive literature on mutual funds and its relation to our paper. We describe our data and summary statistics in section 3. We present our methodology and empirical findings in section 4. Section 5 concludes.

2 Literature Review

It is well documented in the literature that investors tend to chase past fund performance. Earlier studies report a positive *linear* relation between fund performance and new money flows. Recent studies have, however, documented a *nonlinear* relation between performance and new money flows, in that the growth in cash inflows is disproportionately greater for funds performing in the top deciles.

Numerous studies have demonstrated that mutual fund investors chase fund performance. Among these, Spritz (1970) reports a contemporaneous positive linear relation between performance and flow for twenty mutual funds over the period 1960 to 1967. Similar results, exploiting different samples and approaches, are reported in Smith (1978), Kane, Santini and Aber (1991), Ippolito (1992), and Patel, Zeckhauser and Hendricks (1994).[8] In short, there is extensive evidence that investors buy funds with strong past performance. Thus, not surprisingly, fund managers need to deliver

[8]At the aggregate level, Warther (1995) and Zheng (1999b) both document a contemporaneous positive linear relation between aggregate flows into mutual funds and security market returns. Lakonishok, Shleifer, and Vishny (1992) detects a positive association between the number of new accounts gained and the three-year industry adjusted returns by investigating 250 institutional money managers.

good performance in order to attract new funds.

Several papers have called attention to the *nonlinearity* in the performance-flow relation. Ippolito (1992) points out that the performance-flow relation is stronger for funds with positive rather than negative market-adjusted returns. The existence of a nonlinear flow-performance is confirmed by Goetzmann and Peles (1997). Gruber (1996), Chevalier and Ellison (1997), and Sirri and Tufano (1998) document a similar nonlinear performance-flow relation. The message of these papers, therefore, is that stellar performance – not just good performance – is the key to attracting new money. There is (relatively) little penalty for performing poorly. As a consequence, some fund families, especially those of lower ability, may have the incentive to adopt strategies that increase their chances of generating star funds.

The effect of incentives on a fund manager's investment decisions has been studied in some papers. Among these, Chevalier and Ellison (1997) reveals that fund managers alter the riskiness of their portfolios at the end of the year in order to exploit the nonlinear shape of the performance-flow relation. Brown, Harlow and Starks (1996) finds that managers of investment portfolios likely to end up as losers manipulate fund risk differently than others. This is attributed to the fact that managers' compensation and career concerns are linked to relative performance.

There are relatively few papers that study the decisions at the level of the mutual fund complex. Goetzmann and Ibbotson (1993) discuss the notion that fund complexes maximize the probability of having a fund at the top of the rankings by managing many funds and by minimizing cross-fund correlations. Khorana and Servaes (1999) study the decision by fund families to start new funds. Khorana and Servaes (2000) analyze the determinants that drive market share in the mutual fund industry. They provide evidence that the presence of a star fund has a strong positive "spillover" effect on fund family market share. In a paper to address the question of why there are so many mutual funds, Massa (2000) models the process that endogenously leads to market segmentation and to fund proliferation. It explains category and fund proliferation on the basis of the "spillover" effect that the performance of a fund provides to other funds in the same family. The empirical evidence in this paper is consistent with the model in Massa (2000).

Ivkovic (2001) documents a positive spillover effect from the performance of other member funds in the family. However, the paper finds little evidence that the presence of individual stellar funds in the family helps to attract more money to other member funds. The difference in results may come from the performance measures and the definition of star funds. For instance, Ivkovic (2001) defines star US equity funds based on their relative performance within each of the 17 sub-investment objectives, while our paper defines star funds based on the risk-adjusted returns of all diversified equity funds. Note that when identifying star funds within the 17 very fine sub-categories, a star fund can actually have very poor performance when compared to all US equity funds. As pointed out by Brown and Goetzmann (1997), the investment objectives do a poor job at forecasting future performance and describing investment strategies of funds. We believe that it is more plausible that investors pay attention to performance across style categories and are willing to switch to funds with the strongest performance overall. For our sample period, Morningstar star ratings are also based on the relative risk-adjusted performance of all funds in the equity fund category. Using our approach, we find evidence indicating that the presence of a star performer has significant impact on the cash inflows not only to itself but also to other funds in the family.

3 Data Sources and Variable Definitions

3.1 Mutual fund data

Our data sample is from the mutual fund database compiled by Center for Research in Security Prices (CRSP). This data set provides open-end mutual fund data for all funds, including defunct funds. For our study we include all diversified U.S. equity funds over the period January 1992 to December 1998, for which fund complex information, monthly fund total net assets (TNA), monthly fund returns, and annual fund characteristics (turnover ratio, expense ratio, load, etc.) are available. Our sample excludes sector funds, international funds and balanced funds.[9]

3.2 Definition of variables

To measure the performance of a mutual fund family, we calculate the weighted average of three-factor adjusted returns of all member funds within the family. For robustness, we also use one-factor (or CAPM) adjusted returns, four-factor (momentum) adjusted returns, and raw returns to measure fund and family performance. These alternative measures are defined later. For each fund, the three-factor adjusted returns are estimated using the Fama and French three-factor model (Fama and French (1993)). Specifically, we use the following OLS regressions to estimate fund factor loadings and α measures:

$$R_{it} - R_{ft} = \alpha_i + \beta_{iRMRF}\mathrm{RMRF}_t + \beta_{iSMB}\mathrm{SMB}_t + \beta_{iHML}\mathrm{HML}_t + e_{it}, \quad (1)$$

where R_{it} is the rate of return of fund i in month t, R_{ft} is the one month T-bill rate in month t, R_{mt} is the rate of return of the market in month t, $\mathrm{RMRF}_t \equiv R_{mt} - R_{ft}$ is the excess market return in month t, SMB_t is the rate of return on the mimicking portfolio for the size factor in stock returns in month t, HML_t is the rate of return on the mimicking portfolio for the book-to-market equity factor in stock returns in month t, α is the excess return of the corresponding factor model, and βs are the factor loadings of the corresponding factors. Using the estimated factor loadings (βs) and excess return α, we define the three-factor adjusted return (α_{it}) for fund i in month t as

$$\alpha_{it} \equiv \alpha_i + e_{it}. \quad (2)$$

We then compute the three-factor adjusted return α_{ft} of fund family f in month t as the weighted average of three-factor adjusted returns of all member funds within family f:

$$\alpha_{ft} = \frac{\sum_{i=1}^{n} \alpha_{it}\mathrm{TNA}_{it}}{\sum_{i=1}^{n} \mathrm{TNA}_{it}}, \quad (3)$$

[9] Another concern about the use of other fund types is that the standard (Fama-French) three factor model may not be appropriate in some of these contexts and may require additional risk factors to span the space covered by their investments.

where TNA_{it} is the total net assets of fund i in month t, and n is the total number of member funds within family f.

The new money or cash flow of a mutual fund family is calculated as the sum of new money of all member funds. For each member fund, new money is defined to be the dollar change in TNA, net of price appreciation in the fund assets. Assuming that new money is invested at the end of each month, the cash flow for fund i in month t is given by

$$\text{Newmoney}_{it} = \text{TNA}_{it} - \text{TNA}_{i,t-1} * (1 + R_{it}). \tag{4}$$

Normalizing the new money by TNA at the beginning of the month gives a measure for new money growth:

$$\text{Newmoneygrowth}_{it} = \frac{\text{Newmoney}_{it}}{\text{TNA}_{i,t-1}} \tag{5}$$

For any mutual fund family f, the family-level new money and new money growth are calculated as

$$\text{Newmoney}_{ft} = \sum_{i=1}^{n} \text{Newmoney}_{it}, \tag{6}$$

$$\text{Newmoneygrowth}_{ft} = \frac{\text{Newmoney}_{ft}}{\sum_{i=1}^{n} \text{TNA}_{i,t-1}}. \tag{7}$$

As discussed in the introduction, the cross-sectional variation in the performance of funds in a family may affect the likelihood of a star fund performance. A family with a greater cross-sectional variation in the performance of its member funds, whether by choice or not, has a greater probability of producing star funds. On the other hand, a relatively low variation in cross-fund returns may indicate sharing of information and coordination among member funds. Hence, a natural proxy for the strategy chosen by family management is the standard deviation of cross-fund returns. For any fund family f in month t, we calculate the cross-fund standard deviation of three-factor adjusted returns Stdev_{ft} as

$$\text{Stdev}_{ft} = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (\alpha_{it} - \overline{\alpha_{ft}})^2}, \tag{8}$$

where $\overline{\alpha_{ft}}$ is the mean of three-factor adjusted returns of all member funds within family f in month t.[10]

The family-level turnover ratio, expense ratio, and front-end load are calculated as the weighted average of the corresponding fund-level measures. The weights used here are fund-level TNAs.

Finally, we need a procedure to identify star and dog funds.[11] For each month in the sample period, we calculate the average three-factor adjusted return over the previous 12 months for each fund. The top (bottom) 5 percent funds with the highest (lowest) monthly average returns are then defined as the *star (dog) funds* for that month. For any given month, a fund family is defined as a *star (dog) family* if it has at least one star (dog) fund under management. Otherwise, it is defined as a *nonstar (nondog) family*.

As a robustness check, we also employ alternative risk-adjustment models to evaluate fund performance. The alternative measures include one-factor adjusted returns, four-factor adjusted returns, and raw returns. The one-factor and four-factor adjusted returns for each fund are estimated by using the single (market) factor model and the Carhart four-factor (the Fama-French three factors plus the momentum factor) model, respectively. Specifically, we use the following OLS regressions to estimate fund factor loadings and α measures:

$$R_{it} - R_{ft} = \alpha_i + \beta_{iRMRF}\mathrm{RMRF}_t + e_{it}, \tag{9}$$

$$R_{it} - R_{ft} = \alpha_i + \beta_{iRMRF}\mathrm{RMRF}_t + \beta_{iSMB}\mathrm{SMB}_t + \beta_{iHML}\mathrm{HML}_t + \beta_{iMOM}\mathrm{MOM}_t + e_{it}, \tag{10}$$

where MOM is the return on a value-weighted, zero-investment, factor-mimicking portfolio for one-year momentum in stock returns. With the estimated factor loading

[10] We adjust for multiple share classes of the same fund in our calculation. Many funds are sold in multiple share classes. The classes differ in terms of the timing, the amount of load charges and annual expenses, including 12b-1 fees. We find as many as 5 share classes of a single fund. In the CRSP mutual fund database, different share classes of the same fund are treated as different funds. When we calculate the standard deviation of cross-fund returns, we adjust for the multiple share classes so that we only count the same fund once.

[11] When we identify star and dog funds, we also adjust for the multiple share classes so that we do not count the same fund more than once.

βs and excess return αs, we define the one-factor and four-factor adjusted returns for fund i in month t as in equation (2). Using the fund-level one-factor and four-factor adjusted returns, we calculate the family-level one-factor and four-factor adjusted returns as in equation (3) and the cross-fund standard deviations of one-factor and four-factor adjusted returns as in equation (8). In the case of raw returns, the family-level raw return measure is simply the weighted average of raw returns (R_{it}) of all member funds within the family, and the cross-fund standard deviation of raw returns is defined as in equation (8). To examine whether the results are sensitive to alternative ranking mechanisms, we also identify the star (dog) performers by ranking on the basis of the one-factor adjusted returns, four-factor adjusted returns, and raw returns.

Alternatively, we identify MS stars as the 5-star rated funds by Morningstar. Morningstar star ratings are featured in mutual fund advertisements, and many investors use the ratings in their fund selections. A 5-star rating indicates a stellar performance. We replicate the Morningstar ratings based on the description published by Morningstar. Morningstar ranks funds within four categories: stock funds, international stock funds, taxable fixed-income funds, and tax-free municipal-bond funds. We rank funds within our overall sample because our sample consists of only diversified US equity funds. Only funds with at least three years of performance history are given ratings. Ratings are calculated for three-, five- and ten-year periods if available, and are then weighted to calculate an overall rating. In general, a fund's rating is determined by the difference between a return component and a risk component. We describe details of the procedure that Morningstar uses to assign star ratings in the Appendix.[12]

[12] To check the accuracy of our star rating replication, we compare the group of 5-star funds generated by our replication exercise with those reported in Morningstar Principia Pro Plus. We randomly pick a date: May, 1995 and compare the two groups. Overall, our replication results are close to those disclosed by Morningstar. There are 76 five-star funds from our calculation and 81 five-star funds from the Morningstar publication. Sixty seven five-star funds are common between the groups. The discrepancy between the two groups is mostly due to the universe of funds considered as our sample is not identical to the funds included in Morningstar US stock funds.

3.3 Summary statistics

Table I provides annual summary statistics for mutual fund families. The number of fund families in the sample increases from 178 in 1992 to 278 in 1998. The average size of fund families also increases over this period in terms of both the number of member funds and the total net assets under family management. The average number of funds managed by a family is 3.88 in 1992. In 1998, the number climbs to 6.83. On average, the TNA managed by a fund family increases almost three times, from 1,638.09 million dollars in 1992 to 4,121.75 million dollars in 1998. Moreover, the average TNA per member fund also exhibits a dramatic increase over the sample period. The family turnover ratios and expense ratios appear quite stable over the sample period, while the average front-end loads decrease from 2.14 percent to 1.21 percent. The last two columns of the table report the summary statistics for three-factor adjusted returns and cross-fund standard deviation of three-factor adjusted returns. For all years in the sample period (except 1993), the average excess return (three-factor adjusted) earned by fund families is negative. Overall, the average standard deviation of three-factor adjusted returns exhibits an increasing trend.

To better understand the characteristics of star funds and families, in Table II we report summary statistics for the stars identified at the end of each calendar year over the sample period. The number of star funds increases from 39 in 1992 to 72 in 1998, due to the increase in sample size. The average performance of star funds, measured by three-factor adjusted returns over the year, is typically above 1 percent on a monthly basis. In the context of fund families, the average size of star families (measured by the number of member funds under management) and the average cross-fund standard deviation of three-factor adjusted returns are both higher than the corresponding average statistics reported in Table I. For instance, an average star family manages over 10 member funds in 1998, well above the average number of 6.83 funds for the full sample. Meanwhile, the cross-fund standard deviation of returns for star families averages 1.73 percent versus 1.47 percent for all fund families. Hence, preliminary evidence suggests that fund families with more member funds and higher cross-fund standard deviation of returns are more likely to produce stars. We will revisit this issue in section 4.2 with more direct evidence.

To get an idea on how star funds are distributed among different families, we categorize fund families into four different groups based on the following family characteristics: cross-fund standard deviation of three-factor adjusted returns and number of member funds. A fund family is defined as having high (low) standard deviation if its average cross-fund standard deviation of returns over the previous 12 months is above (below) the industry median. Similarly, a fund family is defined as large (small) if its average number of member funds over the previous 12 month is above (below) the industry median. As indicated in Table II, most star families belong to the group of high standard deviation families.

4 Methodology and Empirical Results

4.1 What Does A Star Bring to the Family?

4.1.1 The star-fund effect on family-level new money growth

To explore the effect of star funds on family cash flows, we compare the new money growth of star families to that of nonstar families, after controlling for past family performance and other family characteristics. Specifically, we estimate the following fixed effect panel regression:

$$\begin{aligned}
& (\text{Newmoneygrowth})_{f,t} \\
= \; & \alpha_f + \beta_1 * (\text{Past Performance})_{f,[t-12,t-1]} + \beta_2 * (\text{Cross-Fund Standard Deviation})_{f,t-1} + \\
& \beta_3 * (\text{Number of Funds})_{f,t-1} + \beta_4 * (\text{Family Size})_{f,t-1} + \\
& \beta_5 * (\text{Turnover Ratio})_{f,t-1} + \beta_6 * (\text{Expense Ratio})_{f,t-1} + \\
& \beta_7 * (\text{Front-end Load})_{f,t-1} + \beta_8 * (\text{Star Family Dummy})_{f,[t-12,t-1]} + \\
& \beta_9 * (\text{MS Star Family Dummy})_{f,[t-12,t-1]} + \\
& \beta_{10} * (\text{Dog Family Dummy})_{f,[t-12,t-1]} + \varepsilon_{f,t}. \qquad (11)
\end{aligned}$$

Here, f is the index for fund family, t is the index for month, and α_f captures the family fixed effect. Other than the dummy variable indicating star identity, the other variables are similar to those used in other studies of the performance-flow relation. The variable (Newmoneygrowth) is given by equation (7). (Past Performance) is measured by the average family-level risk-adjusted return over the previous 12 months. (Cross-Fund Standard Deviation) is calculated by equation (8). (Number of Funds) is the logarithm of the total number of member funds managed by the family. (Family Size) is measured by the logarithm of average TNA per member fund relative to the TNA per fund of the median family. (Turnover Ratio), (Expense Ratio), and (Front-end Load) are defined as in the previous section.

To analyze the impacts of star and dog performers in the fund family, we rely on indicator variables (Star Family Dummy), (MS Star Family Dummy) and (Dog Family Dummy). (Star Family Dummy) equals one if fund family f has at least one star fund under management. For each month in the sample period, the star funds and star families are identified by ranking the factor-adjusted returns in the previous 12 months. Similar definition applies to (Dog Family Dummy). (MS Star Family Dummy) equals one if a fund family has at least one MS star according to Morningstar ranking. The coefficients of the star family dummies capture the mean difference in new money growth between star and nonstar families, after controlling for other variables that potentially affect new money growth. It indicates whether the presence of one or more star funds helps the family attract additional new money in the future.[13]

To control for autocorrelation and heteroscedasticity in the panel regression, we allow for disturbances to follow a common AR(1) process and for each family (panel) to have its own variance. Moreover, we allow for disturbances to be contemporaneously correlated across families (panels). The regression results are reported in Table III. As a robustness check, we estimate panel regression (11) using alternative

[13] Controlling for the impacts of past performance and other family characteristics, the star family dummy captures the convexity/non-linearity in the flow-return relationship. Moreover, it captures the spillover effect associated with a star performance at the family level.

measures of risk-adjusted returns and star ranking mechanisms.[14]

As discussed above, we are particularly interested in the coefficient estimates for the star family dummy. The results presented in Table III indicate that the coefficients on the star family dummy are positive and significant for all performance measures. The finding provides supporting evidence that having a star fund increases the total level of new money flows to the entire family. In the columns labeled as 3-Factor Star, we report coefficient estimates when three-factor adjusted returns are used to measure past performance, to calculate cross-fund standard deviation, and to identify star and dog performers. The new money growth for star families is, on average, 4.4 percent (on an annual basis) higher than that for nonstar families. Given the average family TNA (4,122 million dollars) at the end of 1998, this implies that a star family, on average, attracts 181 million dollars more than a nonstar family on an annual basis. The finding of a "spillover" effect at the family level is consistent with the evidence in Khorana and Servaes (2000). The results are similar but slightly weaker when we use the one-factor risk-adjustment (as shown in the columns labeled as 1-Factor Star).

So far we have documented that a star performance has a strong positive impact on family-level new money growth. A natural question to investigate in this context is about the impact of having a dog (a very poorly performing fund) in the family. For a variance increasing strategy to be attractive at the family level, it needs to be verified that family-level cash flows exhibit an asymmetry pattern in response to fund performance. Family management would have little incentive to adopt investment strategies that increase the odds of producing both stars and dogs – if there were substantial negative spillover effects associated with having a dog in the family. As reported in Table III, the coefficient estimate on the dog family dummy is negative but not statistically significant, regardless of the performance measures. Moreover,

[14] As another robustness check, we estimate regression (11) using raw returns to measure past performance, to calculate cross-fund standard deviation of returns, and to identify star and dog performance. The coefficient estimates are similar to those reported in Table III. Moreover, we examine the impact of having multiple stars on family-level new money growth. After controlling for the star identity of fund families, the coefficient estimate for the multiple star dummy is estimated, as expected, to be positive. It is not, however, statistically significant. Hence, we do not have reliable evidence that having multiple stars helps star families attract additional cash flows.

the point estimate of the coefficient on the dog family dummy is much smaller than the point estimate of the coefficient on the star family dummy.

Next, we compare the new money growth of MS star families to other non MS star fund families. In the columns labeled as MS Star, we use Morningstar rankings to identify star families, while we use three-factor adjusted returns to define past performance and cross-fund standard deviation, . The MS star family dummy is economically and statistically significant, indicating that having a MS star fund increases the total level of new money flows to the fund family. It is interesting to note that the coefficient on the MS star family dummy is more than twice as large as that of the star dummy defined earlier. This finding suggests that MS stars, possibly on account of their sustained performance over longer periods, have even more power in generating total new money for a family than the previously defined stars. In the last columns (labeled as Combined) of Table III, we include both the star family dummy (defined by three-factor adjusted returns) and the MS star family dummy in the regression. Consistent with the low rate of overlap between the two star measures, both coefficients remain significant. The coefficient estimates are very similar to those obtained earlier when we examine the effect of the two star measures separately.

The regression results in Table III also indicate that family cash flows are positively related to past performance, and are negatively related to turnover ratio, expense ratio and front-end load during our sample period.

4.1.2 The star-fund effect on other funds in the family

Having found the star-fund effect on new money growth at the family level, we now examine whether a star fund helps attract greater cash inflows to other funds in the same family. As mentioned, such a spillover may occur if investors come to have a more positive view of other funds in the star family. These may also occur if new investors attracted to the star fund find it cost effective to diversify by investing in other funds in the same family. A spillover effect would result in higher new money growth for the nonstar funds in star families than for similarly situated funds in nonstar families. On the other hand, if the cash inflows to star funds are largely the consequence of cannibalizing cash flows from other funds in the same family, the new money growth for nonstar funds in star families may well be lower.

To investigate such spillover effects, we estimate the following fixed effect panel regression by utilizing fund-level information and by explicitly taking into account whether a particular fund belongs to a star family or not:

$$\begin{aligned}
& (\text{Newmoneygrowth})_{i,t} \\
= \; & \alpha_i + \beta_1 * (\text{Past Performance})_{i,[t-12,t-1]} + \beta_2 * (\text{Fund Size})_{i,t-1} + \\
& \beta_3 * (\text{Turnover Ratio})_{i,t-1} + \beta_4 * (\text{Expense Ratio})_{i,t-1} + \\
& \beta_5 * (\text{Front-end Load})_{i,t-1} + \beta_6 * (\text{Star Fund Dummy})_{i,[t-12,t-1]} + \\
& \beta_7 * (\text{Star Family Dummy})_{i,[t-12,t-1]} + \beta_8 * (\text{MS Star Fund Dummy})_{i,[t-12,t-1]} + \\
& \beta_9 * (\text{MS Star Family Dummy})_{i,[t-12,t-1]} + \beta_{10} * (\text{Dog Fund Dummy})_{i,[t-12,t-1]} + \\
& \beta_{11} * (\text{Dog Family Dummy})_{i,[t-12,t-1]} + \varepsilon_{i,t}. \qquad (12)
\end{aligned}$$

In the above regression, i is the index for individual fund, t is the index for month, and α_i captures the fixed fund effect. (Past Performance) is measured by the average fund-level risk-adjusted return over the previous 12 months. (Fund Size) is computed as the logarithm of fund-level TNA relative to the TNA of the median fund. (Turnover Ratio), (Expense Ratio), and (Front-end Load) are all fund-level statistics. The remaining four variables are dummies. (Star Fund Dummy) equals one if the fund itself is a star fund, while (Star Family Dummy) equals one if the fund is not a star but belongs to a star family. For each month in the sample period, the star funds and star families are identified by ranking the monthly averages of risk-adjusted returns in the previous 12 months. Similar definitions apply to (Dog Fund Dummy) and (Dog Family Dummy). In addition to the star performers defined using the factor models, we also consider the impact of star performers identified by the Morningstar rankings. (MS Star Fund Dummy) equals one if the fund itself is an MS star, while (MS Star Family Dummy) equals one if the fund is not an MS star but belongs to a family that has at least one MS star fund under management. As before, the regressions are estimated allowing for autocorrelation (AR1) of residuals and cross-fund heteroscedasticity.

The coefficient estimate of β_7 indicates the spillover effect of star funds on the cash flows of nonstar funds in the same family. Specifically, it measures the mean difference in new money growth between the nonstar funds in star families and other nonstar funds. A significant spillover effect will be indicated by the coefficient being positive and significant. As a robustness check, we estimate panel regression (12) using alternative measures of risk-adjusted returns and star ranking mechanisms. All coefficient estimates are reported in Table IV.[15]

In the columns labeled as 3-Factor Star, we report coefficient estimates when three-factor adjusted returns are used to measure past performance and to identify stars and dogs. The coefficient estimates on the star fund dummy are positive and significant at the 1 percent level. Specifically, the new money growth for a star fund is, on average, about 13 percent (on an annual basis) higher than that for a nonstar fund. This result is not surprising since, as earlier studies have documented, a strongly performing fund attracts a disproportionate inflow of funds relative to the cash outflow when performance is poor. More interestingly, the regressions provide evidence that there are positive spillover effects associated with a star performance. The star identity of a family brings more cash inflows to its nonstar member funds, as indicated by the positive and significant coefficient estimates for the star family dummy. The subsequent new money growth for its nonstar member funds is, on average, 4.4 percent (on an annual basis) higher than that for other nonstar funds. Hence, both the star and nonstar funds in a star family benefit from the star identity. As one might expect, the magnitudes of the coefficients indicate that a star fund

[15] As another robustness check, we estimate regression (12) using raw returns to measure past performance and to identify star and dog performers. The coefficient estimates are similar to those reported in Table IV. Moreover, we examine the spillover effect of having multiple stars in the family by adding a multiple-star family dummy in the regression. After controlling for the star identify of the family to which a fund belongs, the multiple-star effect is found to be negative and statistically insignificant. Hence, there is no evidence that having multiple stars in the family generates additional positive spillover effect to other family members. As an alternative to the panel regression approach, we also conduct month by month cross-sectional regression analysis and use the approach proposed by Fama and MacBeth (1973). The results confirm the existence of a strong positive spillover effect from a star performer.

attracts more new money than a nonstar fund that belongs to a star family. Columns labeled as 1-Factor Star in Table IV report coefficient estimates when one-factor adjusted returns are used to measure past performance and to identify stars and dogs. Clearly, the spillover result is robust to using one-factor adjusted returns to measure performance.

For perspective on the economic significance of the spillover effect, note that the average fund family has about seven members in 1998. Assuming that the TNAs of funds are similar, the spillover effect is such that, compared to a stand alone star fund, the overall cash inflows from a star performance in the context of an average family are about 27 percent larger. Hence, compared to a stand-alone star fund, an average sized family receives an increase in fund inflow that is more than 3 times larger. The magnitude of the spillover effect is, therefore, substantial and could well affect fund families' investment strategies and, thus, decisions regarding the number of funds in a family and the introduction of new funds.

As discussed in the previous section, for a variance increasing strategy to be attractive at the family level, it needs to be verified that there are no substantial negative spillover effects associated with having a dog in the family. As reported in Table IV, the coefficients on the dog fund dummies are negative and significant at the 1 percent level, indicating that poorly performing funds lose money or attract significantly less money than other funds. In particular, when three-factor adjusted returns are used as the performance measure, the new money growth for dog funds is on average 6.7 percent lower than that for other funds on an annual basis. The coefficients on the dog family dummies, however, are small in magnitude and statistically insignificant, indicating that the existence of a dog fund does not have much impact on the cash flows of other funds in the family. Hence, unlike for star funds, there is no evidence of a negative spillover effect associated with a dog performance.

In the columns labeled as MS Star, we use MorningStar rankings to identify star funds and star families.[16] Interestingly, the spillover effect of MS stars is similar

[16]The dog funds are defined by the three-factor model.

in magnitude and statistical significance to the spillover effect that we observe for the stars defined earlier, as indicated by the fact that the coefficient on the MS star family dummy is comparable to the coefficient on the star family dummy. Hence, the higher total family new money attracted by MS stars documented in Table III is mainly driven by the higher new money flows into the MS star funds themselves. The coefficient on the (MS Star Fund Dummy) is higher than the coefficient on the (Star Fund Dummy), indicating that either investors pay more attention to long-term performance or they use Morningstar star ratings in selecting funds. The finding that an MS star fund attracts abnormal new money is consistent with the evidence in Del Guercio and Tkac (2002). In the last column (labeled as Combined) of Table IV, we report regression results that include both types of star dummies. The coefficient estimates for (Star Family Dummy) and (MS Star Family Dummy) are both positive and significant at the 5 percent level. Again, the results indicate that the stars defined by our procedure and the stars identified by Morningstar rankings have a largely independent impact on fund flows.

In summary, we find evidence indicating that: (1) having a star fund significantly increases family-level new money growth; (2) funds (non-stars) that belong to star families attract significantly greater amounts of new money than funds that belong to nonstar families; (3) star funds attract significantly greater amounts of new money than nonstar funds.

4.2 What Makes A Star?

The cash flow patterns discussed in the previous section indicate that a family is well rewarded in terms of new cash inflows for producing star funds. A star performance may simply reflect attributes of the fund family, rather than investment ability. In this section we investigate family characteristics that may increase the odds of producing a star fund.[17] These will also be the attributes that a family seeking to enhance the

[17] Goetzmann and Ibbotson (1993) point out that the collection of mutual funds under management by a fund family resembles a portfolio of options due to the high payoffs of a star fund. As such, the value of the portfolio is maximized by increasing the variance of individual fund performance

odds of producing a star might want to acquire.

For each year in the sample period, we estimate a logit model to explore the relationship between the probability of a star performance and potentially relevant family characteristics: cross-fund standard deviation of three-factor adjusted returns, family size, total number of funds within the family, family turnover ratio, family expense ratio, and family front-end load. In any given year, family characteristics are calculated as monthly averages. Besides the above family characteristics, we add two dummies in the regression indicating a family's star and dog identity in the previous year.

For the purpose of our empirical study, we estimate the following logistic regression model:

$$\begin{aligned} S_f &= \beta_0 + \beta_1 * (\text{Cross-Fund Standard Deviation})_f + \beta_2 * (\text{Family Size})_f + \\ &\quad \beta_3 * (\text{Number of Funds})_f + \beta_4 * (\text{Turnover Ratio})_f + \\ &\quad \beta_5 * (\text{Expense Ratio})_f + \beta_6 * (\text{Front-end Load})_f + \\ &\quad \beta_7 * (\text{Lagged Star Dummy})_f + \beta_8 * (\text{Lagged Dog Dummy})_f. \end{aligned} \tag{13}$$

Here, f is the index for fund family, S is an indicator variable that equals one if the family has at least one star fund and zero otherwise. (Standard Deviation) is the monthly average of the cross-fund standard deviations of three-factor adjusted returns for the family, (Family Size) is the logarithm of monthly average of the relative family size (measured by the average TNA per member fund relative to industry median), (Number of Funds) is the logarithm of monthly average of the total number of member funds managed by the family, and (Turnover ratio), (Expense Ratio), and (Front-end Load) are the monthly averages of the corresponding statistics for the family. (Lagged Star Dummy) is a dummy variable that equals one if the family has at least one star fund in the previous year. (Lagged Dog Dummy) is a dummy variable that equals one if the family has at least one dog fund in the previous year. In each year, star

and decreasing the correlations across funds. They also hypothesize that the more funds a family manages, the higher the probability that one of them will be a winner, if only due to pure luck. Other factors may also affect the likelihood of creating a star fund. For example, higher research effort or expenses may increase the likelihood of producing a star fund.

(dog) funds are defined as the top (bottom) 5% performers with the highest (lowest) monthly average three-factor adjusted returns.[18]

In Table V(A), we present the results of the logistic regression (13).[19] Among all the family characteristics examined, the cross-fund standard deviation of three-factor adjusted returns has the most consistent and positive impact on the probability of producing star funds over the sample period. The coefficient estimates are significant at the 5 percent level for all years except for 1998. Another family characteristic, number of funds, also exhibits a positive but weaker impact on the probability of producing stars. The coefficient estimates on (Number of Funds) are significant for four out of seven years. Moreover, we find no evidence that current star or dog identity has a significant impact on the probability of creating stars in the subsequent year.

For perspective on how the changes in standard deviation and the number of member funds affect the probability of producing star funds, we consider a hypothetical family, and use the time series average of the coefficient estimates reported in Table V(A) to calculate the probability. Except for the lagged star and dog dummies, all the other characteristics for the hypothetical family are evaluated at the mean statistics for fund families in 1998. Specifically, the cross-fund standard deviation of returns and the number of member funds for this hypothetical family are 1.47 percent and 6.83, respectively. Moreover, we assume that the hypothetical family is neither a star nor a dog in the previous year. We find that the probability of producing a star fund is 0.28. If the cross-fund standard deviation of returns is increased by 100 percent while keeping everything else unchanged, then the probability of producing a star fund increases to 0.73. The impact of the number of member funds is smaller but still

[18] As a robustness check, we also estimate the logistic regression (13) using alternative performance measures to calculate the cross-fund standard deviation of returns and to identify star and dog performers. These alternative measures include one-factor adjusted returns and raw returns. The coefficient estimates (not reported) are qualitatively similar to those in Table V(A).

[19] Another approach to exploring the relationship between family characteristics and the production of star funds is to estimate a Poisson regression. The Poisson regression examines which family characteristics are critical to determining the expected number of star funds in the fund family – thereby taking into account the probability of having multiple stars. The maximum likelihood estimation results (not reported) indicate that the cross-fund standard deviation of risk-adjusted returns and the number of member funds are again the most important factors determining the expected number of star funds in a fund family.

economically significant. If the family has twice the number of funds under control, the probability of producing a star increases from 0.28 to 0.40.

One may argue that a measure of the average time-series risk of all funds in the family should also be included as an explanatory variable in regression (13). The justification is that the average riskiness of the fund family in the time-series sense could also be an important factor affecting the probability of creating stars. To address this issue, we construct a new variable, (Time-Series Standard Deviation), to measure the average time-series risk of a fund family. For each family in any given year, we first calculate the standard deviation of the monthly three-factor adjusted returns separately for each fund in the family. Then we define the (Time-Series Standard Deviation) for the family as the equally-weighted average of the time-series standard deviations of all funds in the family. It turns out, however, that the (Cross-Fund Standard Deviation) and the (Time-Series Standard Deviation) are highly correlated. The correlation coefficients are about 0.70 over the sample period and are highly significant. Hence, families that have high variance investment strategies across funds also tend to have riskier funds on average. On account of the multicollinearity problem, regression equation that includes both types of standard deviation yields unreliable estimates, and is not reported. When we estimate the logit regression using (Time-Series Standard Deviation) instead of the (Cross-Fund Standard Deviation), the coefficient estimates are positive and significant for all years except for 1998 (not reported).

In Table V(B), we estimate a logit model to investigate what factors affect the probability of creating MS stars. Unlike in the previous case, cross-fund standard deviation is not significantly related to the probability of creating MS stars, suggesting that it is difficult to create (longer-term) MS stars by gaming with investment strategies. There is, however, some evidence that number of funds is related to the probability of creating MS stars. The most significant explanatory variable is the 1-year lagged MS star dummy. However, this is not surprising since Morningstar ratings are calculated based on the past 3-year, 5-year and 10-year returns. In summary, the logit model indicates that increasing the variance in the cross-fund investment strategies does not help create MS stars. As we might expect, adopting high variance investment strategies across funds is more effective and relevant in creating short-term stars.

In summary, a high cross-fund standard deviation of returns appears to be most significantly associated with a family having star funds. Another factor, the number of funds in the family, has a positive but weaker impact on the probability of creating stars. Other characteristics, such as family size, turnover ratio, expense ratio, and front-end load, are not significantly related to the likelihood of having a star fund. On the other hand, we find no evidence that cross-fund standard deviation is significantly related to the probability of creating MS stars. Hence, a variance increasing investment strategy is only useful in creating shorter-term stars.

4.3 Do stars live up to investor expectations?

The cash flow patterns we have reported indicate that investors chase star performance not only at the fund level but also at the family level. Star performances, as we have discussed, are not necessarily indicators of investment ability and may result from a strategy to create stars. It is interesting to note that, from 1992 to 1998, the average number of funds managed by families and the average cross-fund standard deviation of returns have both increased. While the evidence is only suggestive, it is consistent with greater recognition by fund families that star performances are well rewarded by investors.

We use the portfolio approach to investigate two specific issues that have arisen in our discussion about the performance and behavior of fund families.[20]: (1) Can we identify families with superior investment skills? (2) Do lower ability families pursue star creating strategies? We address these issues by comparing the performance of various portfolios constructed on the basis of family characteristics. We first discuss the formation of these portfolios.

[20]We adjust for multiple share classes of the same fund when we form portfolios so that we only count the same fund once.

4.3.1 Portfolio formation

We construct portfolios based on the two family attributes that, as discussed in section 4.2, affect the likelihood of generating stars: cross-fund standard deviation of three-factor adjusted returns and number of member funds. A family is defined as a high standard deviation (HighStd) family if its monthly average cross-fund standard deviation of three-factor adjusted returns in the previous year is above the industry median. Otherwise, the family is characterized as a low standard deviation (LowStd) family. Similarly, a family is defined as large if its monthly average number of member funds in the previous year is above the industry median. Otherwise, the family is characterized as a small family. We also form portfolios based on the above two factors separately for star families and non-star families. We denote all portfolios by family size, cross-fund standard deviation of returns, and the star identity. For example, HighStd-Large-Star refers to the portfolio consisting of all funds belonging to star families with high standard deviation and large size. Other portfolios are similarly denoted. We form our portfolios at the beginning of each calendar year and hold them for one year. We report test results for TNA-weighted portfolios, in which we use the previous year-end TNA as weights.[21] For comparison purposes, we also construct a TNA-weighted diversified portfolio containing all funds in the sample.

As a robustness check, we form portfolios with monthly rebalancing. The portfolios are formed at the beginning of each month based on family characteristics in the previous 12 months. They are held for exactly one month and rebalanced at the end of the month. We report test results for TNA-weighted portfolios, in which we use the previous month-end TNA as weights.

We use the Fama-French three-factor model as well as the one-factor model and the Carhart four-factor model (Carhart 1997) to evaluate portfolio performance. The Carhart model allows us to adjust for momentum in underlying stock returns. In other words, the Carhart performance measure regards a portfolio strategy that only exploits momentum in stock returns as having no superior performance.

[21] We also construct equally-weighted portfolios. The results are qualitatively similar.

4.3.2 Do some families have superior investment skills?

We first examine whether a naive strategy of investing in star families deliver significant benefits to an investor. In panel (A) of Table VI(A), we compare the performance of star and non-star portfolios to that of the diversified portfolio. The results indicate that the star portfolio (consisting of all funds belonging to star families) does not, however, outperform the diversified portfolio. This is consistent with the conjecture that a naive strategy of following star families does not benefit mutual fund investors.

The naive strategy may be improved upon, however, by taking account of a family's ex-ante probability of having one or more star funds. Hence, in investigating investment ability, we examine the performance of star families where the star performance is more likely to be an indicator of investment ability. These are the cases of star families with a relatively low ex-ante probability of producing a star fund.[22]

As we know from section 4.2, families with a large number of funds and high cross-fund standard deviation of returns have a greater ex-ante probability of producing stars. Figure 1 plots the monthly average four-factor adjusted returns for selected portfolios. The plots of one-factor and three-factor adjusted returns exhibit similar patterns.

Only one of these portfolios, the LowStd-Small-Star portfolio, displays positive excess returns: about 1 percent per year after adjusting for the momentum factor and about 2.8 percent per year before adjusting for the momentum factor. Moreover, this portfolio outperforms the diversified portfolio at the 5 percent significance level using all measures of risk-adjusted returns. Note that the LowStd-Small-Star portfolio consists of funds belonging to star families with low standard deviation and small number of funds. Thus, we find evidence that the star families that have a low ex-ante probability of producing stars perform significantly better in the subsequent year compared to the diversified portfolio.

Panels B and C of Table VI(A) document the relative performance between various

[22]For illustration, see footnote 7.

portfolios with annual rebalancing. In Panel B, we compare the performance of the LowStd-Small-Star portfolio to that of other portfolios; In Panel C, the performance of the HighStd-Large-Star portfolio is compared to that of other portfolios.

The results in Panel B suggest that star families with the lower ex-ante probability of producing a star (LowStd-Small-Star portfolio) outperform all other star and non-star portfolios. These results are statistically significant and robust to the use of alterative performance measures. By contrast, the results in Panel C indicate that star families with a higher ex-ante probability of generating stars (HighStd-Large-Star portfolio) underperform the LowStd Star and Non-star portfolios. In other words, the results suggest that a star performance is a strong indicator of ability and future performance only when the ex-ante probability of producing a star is low. As a result, a more discerning strategy of investing in the "true" stars yields superior returns. Overall, this evidence supports the notion that some families have superior investment skills.

Table VI(B) documents the relative future performance between various portfolios with monthly rebalancing. In Panel A, we compare the performance of star and nonstar families to a diversified portfolio. Consistent with our earlier results, the star portfolio does not outperform the diversified portfolio. In Panel B, we compare the performance of the LowStd-Small-Star portfolio to that of other portfolios. Consistent with the portfolio results with annual rebalancing, the four-factor adjusted results suggest that star families with lower ex-ante probability of producing stars (LowStd-Small-Star portfolio) outperform the families with higher ex-ante probability of producing stars (HighStd-Large-Star and HighStd-Small-Star portfolios). However, the results for the one- and three-factor models are similar but statistically insignificant. This is probably due to the fact that momentum factor plays a bigger role with monthly rebalancing. We find a similar pattern in Panel C. There is still evidence using the four-factor adjusted returns that star families with a higher ex-ante probability of creating stars (HighStd-Large-Star) underperform the LowStd-Star and -Nonstar families. Again, the results are not as strong as those with annual balancing, possibly due to the momentum effects on star performance.

4.3.3 Do low ability families pursue star creating strategies?

Families, as discussed above, can differ significantly in terms of investment ability. Do fund families choose to follow different investment strategies based on their investment ability? Specifically, we investigate whether lower ability families are more likely to acquire attributes that enhance the odds of producing stars. We proceed by examining whether the performance of families (both star and non-star), with a greater ex-ante probability of producing stars, is significantly different from that of other families. A significantly worse performance would be consistent with lower ability families resorting to strategies designed to create stars.

As shown in Figure 1, high standard deviation portfolios perform worse than the low standard deviation portfolios, the market, and the diversified portfolio. After adjusting for momentum, we find that the HighStd-Large-Star portfolio underperforms the market by 3.6 percent per year and underperforms the diversified portfolio by 2 percent per year. The performance differences are statistically significant at the 5 percent level. Hence, the evidence indicates that star families that have a greater ex-ante probability of generating stars and are more likely to be following a star creating strategy underperform the market and the diversified portfolio.

Table VII(A) provides a more detailed comparison of the performance differences among annually rebalanced portfolios formed on basis of family strategy, specifically the cross-fund standard deviation of risk-adjusted returns and the number of funds. In Panel A, the performance of high standard deviation families is compared to that of low standard deviation families for all families and separately for star and non-star families; In Panel B, we compare the performance of large families to that of small families; Panels C and D compare the performance of LowStd-Small portfolio and HighStd-Large portfolio to that of other portfolios.

The results in Panel A indicate that cross-fund standard deviation of returns is related to future family returns. First, families with high cross-fund standard deviation of returns perform worse than families with low cross-fund standard deviation.

In other words, families that are more likely to be pursuing a star creating strategy perform worse than families that follow a focused strategy. The performance difference for the entire sample is about 2 percent on an annual basis using the four-factor model and significant at the 5 percent level using both the one-factor and the four-factor model. We then compare the performance between high standard deviation families and low standard deviation families within the star and the non-star groups. Using four-factor adjusted returns, we find that star families with high standard deviation underperform star families with low standard deviation by 2.2 percent in the subsequent year. Consistently, high standard deviation non-star families tend to underperform low standard deviation non-star families by 1.5 percent in the subsequent year. These test results are significant at the 5 percent level. The evidence is consistent with families adopting investment strategies conditioned upon their investment abilities. Families with low investment ability may have a greater incentive to choose variance increasing strategies in order to generate stars. On the other hand, families with higher investment ability are more likely to share information and strategy among member funds, resulting in a lower cross-fund standard deviation.

The results in Panel B indicate that, unlike cross-fund standard deviation of returns, number of funds does not appear to be related to future performance in general. Note, however, that within the LowStd-Star sample, families with small number of funds do significantly outperform those with large number of funds.

Taking a closer look at the evidence, we report in Panel C that the portfolio of low standard deviation and small families outperforms the portfolios of high standard deviation families (HighStd-Large portfolio and HighStd-Small portfolio). The performance difference is significant at the five percent level using the four-factor adjusted returns and significant at the ten percent level when one-factor adjusted returns are used. Moreover, the results in Panel D indicate that the portfolio of high standard deviation and large families significantly underperforms the LowStd-Large and LowStd-Small portfolios. These findings are again consistent with fund families choosing investment strategies across funds based on their investment ability.[23]

[23]There is no evidence that the differences in portfolio performance are affected by differences in

Table VII(B) documents the relative performance between various portfolios with monthly rebalancing. The results in all panels are very similar to those of Table VII(A) in both magnitudes and statistical significance. Hence, the finding that low ability families are more likely to pursue a star creating strategy is robust to a different rebalancing frequency.

In our analysis, we assume that investment strategy is exogenously determined by the investment ability of family management. However, there is a possibility that the investment strategy is endogenously determined. It could happen, for instance, that low cash inflows encourage families to follow star creating strategies. We check the potential endogeneity problem in two ways. First, we regress changes in cross-fund return standard deviation on the new money flow over the previous 1-year. Second, we examine the influence of past flows on the probability of generating stars using the logistic model. The evidence (not reported), however, does not support the existence of such a link. We find no evidence that cross-fund return volatility is affected significantly by past cash inflows. Nor do they have any incremental effect on the probability of generating stars.

From the portfolio analysis, we conclude that high cross-fund standard deviation of returns is associated with poorer future family performance. The results indicate that (1) a star performance reflects superior investment ability when the ex-ante probability of producing stars is low, and (2) families with poorer investment ability are more likely to seek variance increasing strategy, possibly to generate a star performance. Hence, to mutual fund investors that naively chase the glitter of stars – don't!

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expense ratios. We examined the expense ratios of funds in the Large-HighStd portfolios. The mean (annual) expense ratio of funds in this portfolio is 1.45%, virtually identical to the mean expense ratio of 1.43% for all funds in the sample.

5 Conclusion

In this paper, we study the impact of family structure on fund strategy. We first investigate the existence of a spillover effect among funds in a family. Our results indicate that there is a strong positive spillover effect from a star performer: a star fund attracts money not only to itself but also to other funds in the family. Compared to a stand-alone star fund, an average sized family with 7 funds receives an increase in fund inflow that is more than 3 times larger.

We show that lower correlation between fund returns in a family contributes significantly to the probability of producing stars. Having a larger number of funds in the family has a positive but weaker impact. We then investigate two related issues. The first is concerned with whether some families have superior investment ability. We document that a naive strategy of chasing families with star performers does not enhance investor return. However, when the ex-ante probability of the family producing stars is accounted for, star families with low ex-ante probability of producing stars perform significantly better than other families.

The second issue we examine is whether the investment strategy adopted by a family, in particular a star creating strategy, is associated with its investment ability. Using portfolio analysis, we find that factors that enhance the ex-ante odds of producing stars, in particular the cross-fund return standard deviation, are associated with a significantly poorer family performance. This finding is consistent with lower ability families pursuing strategies to take advantage of the cash flow response to a star performance. On the other hand, families that produce stars despite a low ex-ante probability of doing so (i.e., families with fewer member funds and lower standard deviation) appear to have superior investment skills.

1 Appendix: Morningstar Ratings‘

To determine the return component, Morningstar first defines a load-adjusted return as

$MSRet_i = R_i L_i - R_f$

where R_i is the cumulative fund return in the measurement period (three-, five-, ten-year); R_f is the cumulative T-bill return in the corresponding period; L_i is the load adjustment. For example, if there is no load of any type, L_i is one; if there is a front-end load of 5 percent, L_i is 0.95; if there is a back end load, L_i will be adjusted based on the measurement period since back end loads typically decline over time.[1] The $MSRet_i$ can be interpreted as a load-adjusted risk premium. The Morningstar return score is then calculated as

$MS\mathrm{Re}tScore_i = MSRet_i / AvgMS\mathrm{Re}t$

where $AvgMS\mathrm{Re}t$ takes on one of the two values depending on the average of $MSRet_i$ over all funds: if this average is greater than R_f, $AvgMS\mathrm{Re}t$ is set equal to this average value, otherwise it is set equal to R_f.

The Morningstar risk component is determined by

$MSRisk_i = \sum_{t=1}^{n} -\min(r_{it} - r_{ft}, 0)/36$

The $MSRisk_i$ measures deviations of returns from the risk-free returns only when fund returns are below the risk-free returns. It is similar to a semi-variance. The Morningstar risk rating is then calculated as:

$MSRiskScore_i = MSRisk_i / AvgMSRisk$

where $AvgMSRisk$ is the average of $MSRisk_i$ over all funds.

The Morningstar star score is given by

$MSStarScore_i = MS\mathrm{Re}tScore_i - MSRiskScore_i$

To assign star ratings, Morningstar ranks all funds in a category by the $MSStarScore$. The top 10% of funds receive five stars, the next 22.5% receive four stars, the middle 35% receive three stars, the next 22.5% receive two stars, and the bottom 10% receive a single star. The overall star rating, which is the rating that MorningStar highlights in its own publications, is a weighted average of the ratings for three, five and ten years. If a fund has been assigned stars only for three years, the overall star rating is set equal to the three year star rating. If a fund has been assigned stars only for three and five years, the overall star rating is the rounded value of 0.4 times the number of stars for three years plus 0.6 times the number of stars for five years. If a fund has been assigned stars for three, five and ten years, the overall number of stars is rounded value of 0.2 times the number of stars for three years plus 0.3 times the number of stars for five years plus 0.5 times the number of stars for ten years.

[1] For the three-year period, we define $Li = 1 - frontendload - 0.5 * backendload$. For the five-year and ten-year period, we define $Li = 1 - frontendload$. The load adjustment factor we use may not be exactly the same as those used by Morningstar. However, the return rankings are not affected by the possible slight differences in the load adjustment factors as we compare the return scores we construct to those published in Morningstar Principia Pro.

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Table I. Annual Summary Statistics for Mutual Fund Families: 1992-1998

The table reports annual summary statistics for mutual fund families in the period of 1992-1998. Our sample excludes all single-fund families. We adjust for multiple share classes so that we only count the same fund once. For each year in the sample period, the table shows the means and standard deviations of the following family characteristics: the year-end number of mutual fund families, the number of funds within a family, the new money growth (%), the family TNA (in million dollars), the average TNA per member fund (in million dollars), the turnover ratio, the expense ratio (%), the front-end load (%), the three-factor adjusted return (%), and the cross-fund standard deviation of three-factor adjusted returns (%). Except for the year-end number of mutual fund families, all other variables are measured on a monthly basis. For each mutual fund family in the sample, we first calculate the monthly averages of these variables in any given year. Then we calculate the means and standard deviations of the monthly averages across all families.

Year	Number of Families	Number of Funds Per Family	New Money Growth (%)	Family TNA ($ mil.)	Average TNA Per Fund ($ mil.)	Turnover Ratio	Expense Ratio (%)	Front-end Load (%)	3-factor Adjusted Return (%)	Standard Deviation of Returns (%)
	Mean									
1992	178	3.88	1.71	1638.09	275.43	0.76	1.30	2.14	-0.05	1.08
1993	198	4.30	1.73	2071.09	310.88	0.72	1.28	1.90	0.10	1.22
1994	216	4.56	1.20	2127.50	311.14	0.77	1.33	1.66	-0.18	1.05
1995	223	5.03	1.35	2553.43	366.60	0.78	1.30	1.55	-0.16	1.21
1996	238	5.22	1.45	3395.60	453.90	0.78	1.30	1.40	-0.07	1.15
1997	253	5.81	1.92	3816.58	471.18	0.74	1.27	1.20	-0.30	1.30
1998	278	6.83	1.11	4121.75	456.25	0.85	1.29	1.21	-0.23	1.47
	Standard Deviation									
1992	--	3.10	3.76	4925.36	496.40	1.35	0.67	2.42	0.39	0.49
1993	--	4.02	3.36	6786.54	592.47	0.61	0.53	2.30	0.41	0.65
1994	--	4.70	4.20	6408.60	606.70	0.72	0.69	2.19	0.47	0.48
1995	--	5.48	4.02	7004.37	720.02	1.05	0.60	2.12	0.50	0.57
1996	--	5.91	5.50	9415.96	899.13	1.05	0.60	1.99	0.42	0.46
1997	--	6.74	5.63	8860.67	776.04	0.59	1.12	1.84	0.54	0.55
1998	--	7.86	4.54	8978.18	748.99	1.28	0.84	1.80	0.60	0.66

Table II. Summary Statistics for Star Funds and Star Families: 1992 ~ 1998

The table provides summary statistics for the star funds and star families identified at the end of each calendar year in the sample period. Star funds are defined as the top 5% performers with the highest average three-factor adjusted returns over the previous 12 months. Star families are defined as the fund families that have at least one star fund under management. Both the number of star funds and the number of star families are year-end measures. For each star fund in any given year, we compute the monthly average of 3-factor adjusted returns during the year. The average performance of star funds for that year is then measured by the mean of these monthly averages across all star funds. The average size and standard deviation of star families are defined in a similar manner. For each star family in any given year, we first compute the monthly average of the number of member funds and the monthly average of cross-fund standard deviations of 3-factor adjusted returns during the year. The average size and standard deviation of star families for that year are then measured by the means of the corresponding monthly averages across all star families. We also count the number of star families falling into each of the following groups: high standard deviation and large families, low standard deviation and large families, high standard deviation and small families, low standard deviation and small families, and single-fund families. For any given year, a fund family is defined as large (small) family if the monthly average of number of funds under management is above (below) that of the median family. Similarly, a fund family is defined as high (low) standard deviation family if the monthly average of cross-fund standard deviations of three-factor adjusted returns is above (below) that of the median family.

Year	Number of Star Funds	Number of Star Families	Average Perfor-mance of Star Funds (%)	Average Size of Star Families	Average Stdev Of Star Families (%)	Number of High Stdev And Large Star Families	Number of Low Stdev and Large Star Families	Number of High Stdev and Small Star Families	Number of Low Stdev and Small Star Families	Number of Star Families with One Member Fund
1992	39	34	1.17	5.56	1.34	14	4	6	2	5
1993	46	40	1.53	6.80	1.57	22	3	9	2	2
1994	53	41	1.07	6.87	1.31	12	5	10	3	5
1995	60	48	1.39	7.64	1.47	17	6	16	2	4
1996	66	53	1.27	8.50	1.53	22	2	19	4	2
1997	73	64	0.83	8.43	1.47	22	7	15	11	2
1998	72	52	1.33	10.03	1.73	25	7	12	5	0

Table III. The Star-Fund Effect on Family-Level New Money Growth

The table examines the star-fund effect on the family-level new money growth. We estimate the following fixed-effect panel regressions:

$$(\text{Newmoneygrowth})_{f,t} = \alpha_f + \beta_1 (\text{Past Performance})_{f,[t-12,t-1]} + \beta_2 (\text{Cross-Fund Standard Deviation})_{f,t-1} + \beta_3 (\text{Number of Funds})_{f,t-1} + \beta_4 (\text{Family Size})_{f,t-1} + \beta_5 (\text{Turnover Ratio})_{f,t-1} + \beta_6 (\text{Expense Ratio})_{f,t-1} + \beta_7 (\text{Front-end Load})_{f,t-1} + \beta_8 (\text{Star Family Dummy})_{f,[t-12,t-1]} + \beta_9 (\text{MS Star Family Dummy})_{f,[t-12,t-1]} + \beta_{10} (\text{Dog Family Dummy})_{f,[t-12,t-1]} + \varepsilon_{f,t}.$$

Here, f and t denote family and month, respectively. (Newmoneygrowth) is the new money flow into the family normalized by the previous month-end family TNA. (Past Performance) is measured by the average family-level risk-adjusted return over the previous 12 months. (Standard Deviation) is defined as the standard deviation of 3-factor adjusted returns across all funds in the family. (Number of Funds) is the logarithm of the total number of member funds managed by the family. (Family Size) is measured by the logarithm of average TNA per member fund relative to the TNA per fund of the median family. (Turnover Ratio), (Expense Ratio), and (Front-end Load) are defined as the TNA-weighted averages of the corresponding fund-level measures. (Star Family Dummy) and (Dog Family Dummy) are dummies indicating whether the family has at least one star or dog fund under management. (MS Star Family Dummy) is a dummy indicating whether the family has at least one Morningstar 5-star fund under management. The columns labeled as (3-Factor Star) report coefficient estimates when 3-factor adjusted returns are used to measure past performance, to calculate cross-fund standard deviation of returns, and to identify star and dog families. The columns labeled as (1-Factor Star) report coefficient estimates when 1-factor (CAPM) adjusted returns are used to measure past performance, to calculate cross-fund standard deviation of returns, and to identify star and dog families. In the columns labeled as (MS Star), while using 3-factor adjusted returns to define past performance and standard deviation, we use MorningStar rankings instead to identify star families. The last column of the table (labeled as Combined) reports coefficient estimates when both star measures (Star Family Dummy and MS Star Family Dummy) are included in the regression. As in the previous column, we use 3-factor adjusted returns to measure past performance and to calculate standard deviation. The reported coefficient estimates and standard errors are adjusted for autocorrelation (AR1), contemporaneous correlation across panels, and heteroscedasticity. T-statistics are reported in parentheses.

Dependent Variables / Independent Variables	Family New Money Growth (t)						
	3-Factor Star		1-Factor Star		MS Star		Combined
Past Performance (t-12 to t-1)	204.35*** (11.24)	200.36*** (10.68)	159.21*** (8.84)	157.73*** (8.48)	205.17*** (11.76)	201.14*** (11.12)	192.26*** (10.31)
Cross-Fund Standard Deviation (t-1)	7.23 (1.26)	7.40 (1.29)	13.40** (2.56)	13.47** (2.57)	7.71 (1.35)	7.89 (1.38)	7.39 (1.29)
Number of Funds (t-1)	-1.11*** (-4.43)	-1.10*** (-4.33)	-0.94*** (-3.83)	-0.94*** (-3.80)	-1.18*** (-4.75)	-1.16*** (-4.64)	-1.21*** (-4.78)
Family Size (t-1)	-2.25*** (-12.42)	-2.26*** (-12.46)	-2.25*** (-12.40)	-2.25*** (-12.41)	-2.33*** (-13.08)	-2.34*** (-13.11)	-2.36*** (-13.25)
Turnover Ratio (t-1)	-0.54** (-2.12)	-0.54** (-2.12)	-0.57** (-2.23)	-0.57** (-2.24)	-0.53** (-2.09)	-0.53** (-2.10)	-0.54** (-2.11)
Expense Ratio (t-1)	-25.19*** (-2.80)	-24.85*** (-2.77)	-24.06*** (-2.87)	-24.04*** (-2.87)	-25.56*** (-2.87)	-25.21*** (-2.84)	-25.58*** (-2.90)
Front-end Load (t-1)	-45.14*** (-5.07)	-44.94*** (-5.04)	-45.25*** (-5.16)	-45.19*** (-5.15)	-45.96*** (-5.21)	-45.75*** (-5.17)	-46.11*** (-5.21)
Star Family Dummy (t-12 to t-1)	0.37** (2.54)	0.37** (2.55)	0.23* (1.66)	0.23* (1.67)			0.35** (2.40)
MS Star Family Dummy					0.94*** (7.00)	0.94*** (7.01)	0.93*** (6.95)
Dog Family Dummy (t-12 to t-1)		-0.15 (-1.01)		-0.08 (-0.54)		-0.15 (-1.04)	-0.16 (-1.08)
# of observations	15769	15769	15769	15769	15769	15769	15769
Adjusted R-square	0.06	0.06	0.06	0.06	0.06	0.06	0.06

*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Note: All coefficients reported in the table are the actual coefficient estimates multiplied by 100.

Table IV. The Star-Fund Effect on Fund-Level New Money Growth

The table examines the spillover effect associated with the star performance. We estimate the following fixed-effect panel regressions:

$$(\text{Newmoneygrowth})_{i,t} = \alpha_i + \beta_1 (\text{Past Performance})_{i,[t-12,t-1]} + \beta_2 (\text{Fund Size})_{i,t-1} + \beta_3 (\text{Turnover Ratio})_{i,t-1} + \beta_4 (\text{Expense Ratio})_{i,t-1} + \beta_5 (\text{Front-end Load})_{i,t-1} + \beta_6 (\text{Star Fund Dummy})_{i,[t-12,t-1]} + \beta_7 (\text{Star Family Dummy})_{i,[t-12,t-1]} + \beta_8 (\text{MS Star Fund Dummy})_{i,[t-12,t-1]} + \beta_9 (\text{MS Star Family Dummy})_{i,[t-12,t-1]} + \beta_{10} (\text{Dog Fund Dummy})_{i,[t-12,t-1]} + \beta_{11} (\text{Dog Family Dummy})_{i,[t-12,t-1]} + \varepsilon_{i,t}.$$

In the above regression, i is the index for individual fund and t is the index for month. (Past Performance) is measured by the average fund-level risk-adjusted return over the previous 12 months. (Fund Size) is defined as the logarithm of fund-level TNA relative to the TNA of the median fund. (Turnover Ratio), (Expense Ratio), and (Front-end Load) are all fund-level statistics. The remaining six variables are dummies. (Star Fund Dummy) and (MS Star Fund Dummy) equal one if the fund itself is a star or MS star fund, while (Star Family Dummy) and (MS Star Family Dummy) equal one if the fund is not a star or MS star but belongs to a star or MS star family. Similar definitions apply to (Dog Fund Dummy) and (Dog Family Dummy). The columns labeled as (3-Factor Star) report coefficient estimates when 3-factor adjusted returns are used to measure past performance and to identify stars and dogs. The columns labeled as (1-Factor Star) report coefficient estimates when 1-factor (CAPM) adjusted returns are used to measure past performance and to identify stars and dogs. In the columns labeled as (MS Star), while using 3-factor adjusted returns to define past performance and dogs, we use MorningStar rankings instead to identify star funds and star families. The last column of the table (labeled as Combined) reports coefficient estimates when both the star dummies based on the 3-factor adjusted returns and the MS star dummies based on MorningStar rankings are included in the regression. As in the previous column, we use 3-factor adjusted returns to measure past performance and to identify dogs. The reported coefficient estimates and standard errors are adjusted for autocorrelation (AR1) and heteroscedasticity in the residuals. T-statistics are reported in parentheses.

Independent Variables \ Dependent Variables	Fund New Money Growth (t)						
	3-Factor Star		1-Factor Star		MS Star		Combined
Past Performance (t-12 to t-1)	187.55*** (27.89)	180.84*** (24.96)	156.04*** (30.50)	149.04*** (27.50)	189.28*** (29.74)	183.39*** (26.73)	172.86*** (23.82)
Fund Size (t-1)	-4.81*** (-82.84)	-4.82*** (-82.67)	-4.77*** (-82.68)	-4.77*** (-82.63)	-4.91*** (-83.78)	-4.91*** (-83.59)	-4.92*** (-83.92)
Turnover Ratio (t-1)	-0.81*** (-7.71)	-0.81*** (-7.70)	-0.79*** (-7.56)	-0.79*** (-7.55)	-0.78*** (-7.51)	-0.78*** (-7.50)	-0.79*** (-7.53)
Expense Ratio (t-1)	-44.58*** (-5.01)	-44.56*** (-5.01)	-46.06*** (-5.23)	-46.82*** (-5.32)	-45.73*** (-5.16)	-45.69*** (-5.16)	-45.98*** (-5.19)
Front-end Load (t-1)	-13.44** (-2.28)	-13.42** (-2.28)	-13.51** (-2.31)	-13.59** (-2.33)	-12.48** (-2.13)	-12.46** (-2.13)	-12.63** (2.16)
Star Fund Dummy (t-12 to t-1)	1.04*** (5.44)	1.07*** (5.58)	1.63*** (9.35)	1.66*** (9.50)			0.97*** (5.10)
Star Family Dummy(t-12 to t-1)	0.37*** (4.08)	0.37*** (4.09)	0.19** (2.26)	0.19** (2.25)			0.35*** (3.98)
MS Star Fund Dummy					3.09*** (19.96)	3.09*** (19.95)	3.06*** (19.75)
MS Star Family Dummy					0.22** (2.36)	0.22** (2.35)	0.20** (2.13)
Dog Fund Dummy (t-12 to t-1)		-0.56*** (-2.96)		-0.81*** (-4.32)		-0.51*** (-2.73)	-0.55*** (-2.94)
Dog Family Dummy(t-12 to t-1)		0.02 (0.23)		-0.03 (-0.32)		0.01 (0.08)	0.02 (0.24)
#of observations	141663	141663	141663	141663	141663	141663	141663
Adjusted R-square	0.11	0.11	0.11	0.11	0.11	0.11	0.11

*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Note: All coefficients reported in the table are the actual coefficient estimates multiplied by 100.

Table V (A). Factors Affecting the Probability of Producing Star Funds: Stars Based on the 3-Factor Model

The table examines which factors contribute to increasing the odds of producing stars. For each year from 1992 to 1998, we apply the following logit model to examine how family characteristics are related to the probability of producing star funds:

$S_f = \beta_0 + \beta_1$ (Cross-Fund Standard Deviation)$_f$ + β_2 (Family Size)$_f$ + β_3 (Number of Funds)$_f$ + β_4 (Turnover Ratio)$_f$ + β_5 (Expense Ratio)$_f$ + β_6 (Front-end Load)$_f$ + B_7 (Lagged Star Dummy)$_f$ + β_8 (Lagged Dog Dummy)$_f$.

Here, f is the index for fund family and S is an indicator variable that equals one if the family has at least one star fund and zero otherwise. (Cross-Fund Standard Deviation) is the monthly average of the cross-fund standard deviations of 3-factor adjusted returns for the family. (Family Size) is the logarithm of monthly average of the relative family size (measured by the average TNA per member fund relative to that of the median family). (Number of Funds) is the logarithm of monthly average of the total number of member funds managed by the family. (Turnover Ratio), (Expense Ratio) and (Front-end Load) are the monthly averages of the corresponding statistics for the family. (Lagged Star Dummy) is a dummy variable that equals one if the family has at least one star fund in the previous year. (Lagged Dog Dummy) is a dummy variable that equals one if the family has at least one dog fund in the previous year. In this regression, we identify star and dog families in each year based on 3-factor adjusted returns. T-statistics are reported in parentheses.

	1992	1993	1994	1995	1996	1997	1998
Constant	-5.61*** (-4.77)	-5.70** (-4.07)	-3.59*** (-3.39)	-5.28*** (-5.06)	-4.28*** (-4.76)	-3.13*** (-4.40)	-3.96*** (-5.06)
Cross-Fund Standard Deviation	100.60** (2.18)	138.00** (2.97)	135.70*** (2.66)	180.10*** (3.34)	223.60*** (4.14)	111.80** (2.45)	49.61 (1.25)
Family Size	0.49** (2.23)	0.42* (1.89)	0.13 (0.64)	0.14 (0.78)	0.03 (0.22)	-0.17 (-1.22)	0.04 (0.28)
Number of Funds	0.98** (2.05)	1.57*** (3.48)	0.35 (0.86)	1.26*** (3.36)	0.52 (1.58)	0.53* (1.82)	0.38 (1.40)
Turnover Ratio	0.08 (0.58)	0.88* (1.90)	0.68 (1.59)	-0.42 (-0.96)	-0.01 (-0.04)	-0.40 (-1.10)	0.29 (1.10)
Expense Ratio	68.97* (1.95)	-63.01 (-0.80)	-79.42 (-1.29)	-10.34 (-0.20)	-41.80 (-0.93)	-13.99 (-0.82)	40.54 (1.52)
Front-end Load	4.16 (0.43)	-13.50 (-1.14)	0.71 (0.07)	-8.41 (-0.78)	-21.63* (-1.85)	-11.93 (-1.17)	9.28 (0.90)
Lagged Star Dummy	0.61 (1.04)	1.25** (2.08)	1.18** (2.18)	0.30 (0.57)	0.57 (1.25)	0.13 (0.31)	1.22*** (3.08)
Lagged Dog Dummy	0.46 (0.68)	-0.72 (-0.67)	-0.14 (-0.21)	-0.80 (-1.16)	-0.32 (-0.57)	0.67 (1.45)	-0.80 (-1.46)

*** significant at the 1% level ** significant at the 5% level * significant at the 10% level

Table V (B). Factors Affecting the Probability of Producing Star Funds: MS Stars Based on MorningStar Rankings

The table examines which factors contribute to increasing the odds of producing MS stars. For each year from 1992 to 1998, we apply the following logit model to examine how family characteristics are related to the probability of producing star funds:

$$S_f = \beta_0 + \beta_1 \text{ (Cross-Fund Standard Deviation)}_f + \beta_2 \text{ (Family Size)}_f + \beta_3 \text{ (Number of Funds)}_f + \beta_4 \text{ (Turnover Ratio)}_f + \beta_5 \text{ (Expense Ratio)}_f + \beta_6 \text{ (Front-end Load)}_f + B_7 \text{ (Lagged MS Star Dummy)}_f.$$

Here, f is the index for fund family and S is an indicator variable that equals one if the family has at least one MS star fund and zero otherwise. (Cross-Fund Standard Deviation) is the monthly average of the cross-fund standard deviations of 3-factor adjusted returns for the family. (Family Size) is the logarithm of monthly average of the relative family size (measured by the average TNA per member fund relative to that of the median family). (Number of Funds) is the logarithm of monthly average of the total number of member funds managed by the family. (Turnover Ratio), (Expense Ratio) and (Front-end Load) are the monthly averages of the corresponding statistics for the family. (Lagged MS Star Dummy) is a dummy variable that equals one if the family has at least one MS star fund in the previous year. In this regression, we identify MS star funds and MS star families in each year based on year-end Morningstar rankings. T-statistics are reported in parentheses.

	1992	1993	1994	1995	1996	1997	1998
Constant	-3.39*** (-3.34)	-4.14** (-3.12)	-2.46*** (-2.48)	-3.64*** (-3.46)	0.07 (0.07)	-1.55* (-1.93)	-2.15*** (-2.99)
Cross-Fund Standard Deviation	19.63 (0.35)	125.00** (2.20)	45.10 (0.82)	68.42 (1.28)	117.20** (2.08)	-66.62 (-1.21)	-4.92 (-0.14)
Family Size	0.47** (2.05)	0.59** (2.31)	0.27 (1.27)	0.20 (0.99)	0.10 (0.50)	0.31* (1.71)	0.26* (1.74)
Number of Funds	0.08 (0.16)	0.07 (0.15)	0.52 (1.44)	0.74** (2.22)	0.83** (2.47)	0.95*** (3.08)	1.07*** (4.04)
Turnover Ratio	0.01 (0.04)	-0.39 (-0.78)	-0.67 (-1.24)	0.32* (1.66)	-1.02* (-1.90)	-0.67 (-1.43)	-0.30 (-0.93)
Expense Ratio	59.75* (1.70)	8.53 (0.12)	-12.41 (-0.21)	-91.60 (-1.27)	-328.80*** (-4.23)	-4.67 (-0.09)	-33.38 (-0.64)
Front-end Load	-1.46 (-0.15)	3.37 (0.32)	-13.43 (-1.18)	16.63 (1.64)	-8.89 (-0.72)	-22.56* (-1.88)	-13.86 (-1.30)
Lagged MS Star Dummy	2.08*** (4.25)	2.70*** (4.81)	2.69*** (4.89)	1.79*** (3.73)	1.99*** (3.41)	1.92*** (4.36)	0.66* (1.76)

*** significant at the 1% level ** significant at the 5% level * significant at the 10% level

Table VI (A). Relative Performance of Fund Family Portfolios: Annual Rebalancing

The table documents the relative performance between various portfolios. At the beginning of each calendar year, we form portfolios based on the following family characteristics in the previous year: cross-fund standard deviation of 3-factor adjusted returns, family size (measured by number of member funds), and the star identify. The portfolios are held for exactly one year and rebalanced at the year-end. A family is defined as a high standard deviation (HighStd) family if its monthly average cross-fund standard deviation of 3-factor adjusted returns in the previous year is above that of the median family. Otherwise, the family is characterized as a low standard deviation (LowStd) family. Similarly, a family is defined to be large (small) if its monthly average number of member funds in the previous year is above (below) that of the median family. A family is defined as a star family if it has at least one star fund under management based on the monthly average of risk-adjusted returns in the previous year. We denote all portfolios by the family characteristics defined above. LowStd-Small-Star refers to the portfolio consisting of all funds belonging to star families with high standard deviation and small size. Similar notation applies to other portfolios. For each portfolio, we use the monthly average of TNA-weighted risk-adjusted returns during the period 1992 to 1998 to measure performance. Panel A reports the performance difference between the diversified portfolio (including all funds in the sample) and the Star (Non-Star) portfolio. In panel B, we compare the performance difference between LowStd-Small-Star portfolio and other portfolios. In panel C, we compare the performance difference between HighStd-Large-Star portfolio and other portfolios. To check for robustness, we use alternative return measures (1-factor adjusted returns, 3-factor adjusted returns, and 4-factor adjusted returns) to identify star families and to measure portfolio performance. The t-statistics are in parentheses.

Portfolios	1-Factor Adjusted Returns	3-Factor Adjusted Returns	4-Factor Adjusted Returns
Panel A: Diversified Portfolio - Star and Non-star Portfolios			
Star Portfolio	0.050 (0.47)	0.018 (0.23)	0.084 (1.23)
Non-star Portfolio	0.029 (0.38)	0.026 (0.43)	0.001 (0.01)
Panel B: LowStd-Small-Star Portfolio - Other Portfolios			
<u>*Star Portfolios*</u>:			
HighStd-Large	0.431 (2.65)***	0.361 (2.27)**	0.378 (3.64)***
HighStd-Small	0.344 (1.86)*	0.354 (2.06)**	0.326 (2.78)***
LowStd-Large	0.264 (1.71)*	0.351 (2.25)**	0.216 (2.14)**
<u>*Non-star Portfolios*</u>:			
HighStd-Large	0.384 (2.68)***	0.411 (2.71)***	0.283 (2.97)***
HighStd-Small	0.460 (2.68)***	0.421 (2.72)***	0.319 (3.27)***
LowStd-Large	0.229 (1.88)*	0.312 (2.17)**	0.160 (1.91)*
LowStd-Small	0.249 (1.87)*	0.300 (2.03)**	0.176 (1.94)*
Panel C: HighStd-Large-Star Portfolio - Other Portfolios			
<u>*Star Portfolios*</u>:			
HighStd-Small	-0.087 (-0.50)	-0.007 (-0.06)	-0.052 (-0.49)
LowStd-Large	-0.167 (-1.13)	-0.010 (-0.10)	-0.162 (-1.78)*
LowStd-Small	-0.431 (-2.65)***	-0.361 (-2.27)**	-0.378 (-3.64)***
<u>*Non-star Portfolios*</u>:			
HighStd-Large	-0.047 (-0.35)	0.049 (0.53)	-0.095 (-1.10)
HighStd-Small	0.029 (0.18)	0.060 (0.62)	-0.059 (-0.66)
LowStd-Large	-0.202 (-1.71)*	-0.049 (-0.60)	-0.218 (-2.88)***
LowStd-Small	-0.182 (-1.41)	-0.062 (-0.71)	-0.202 (-2.48)**

*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table VI (B). Relative Performance of Fund Family Portfolios: Monthly Rebalancing

The table documents the relative performance between various portfolios. At the beginning of each month, we form portfolios based on the following family characteristics in the previous 12 months: cross-fund standard deviation of 3-factor adjusted returns, family size (measured by number of member funds), and the star identify. The portfolios are held for exactly one month and rebalanced at the month-end. A family is defined as a high standard deviation (HighStd) family if its monthly average cross-fund standard deviation of 3-factor adjusted returns in the previous 12 months is above that of the median family. Otherwise, the family is characterized as a low standard deviation (LowStd) family. Similarly, a family is defined to be large (small) if its monthly average number of member funds in the previous 12 months is above (below) that of the median family. A family is defined as a star family if it has at least one star fund under management based on the monthly average of risk-adjusted returns in the previous 12 months. We denote all portfolios by the family characteristics defined above. LowStd-Small-Star refers to the portfolio consisting of all funds belonging to star families with high standard deviation and small size. Similar notation applies to other portfolios. For each portfolio, we use the monthly average of TNA-weighted risk-adjusted returns during the period 1992 to 1998 to measure performance. Panel A reports the performance difference between the diversified portfolio (including all funds in the sample) and the Star (Non-Star) portfolio. In panel B, we compare the performance difference between LowStd-Small-Star portfolio and other portfolios. In panel C, we compare the performance difference between HighStd-Large-Star portfolio and other portfolios. To check for robustness, we use alternative return measures (1-factor adjusted returns, 3-factor adjusted returns, and 4-factor adjusted returns) to identify star families and to measure portfolio performance difference. The t-statistics are in parentheses.

Portfolios	1-Factor Adjusted Returns	3-Factor Adjusted Returns	4-Factor Adjusted Returns
Panel A: Diversified Portfolio - Star and Non-star Portfolios			
Star Portfolio	0.012 (0.13)	-0.014(-0.19)	0.017 (0.27)
Non-star Portfolio	0.047 (0.60)	0.028 (0.47)	0.017 (0.29)
Panel B: LowStd-Small-Star Portfolio - Other Portfolios			
Star Portfolios:			
HighStd-Large	0.184 (1.21)	0.252 (1.47)	0.230 (2.24)**
HighStd-Small	0.321 (1.62)	0.236 (1.31)	0.226 (1.86)*
LowStd-Large	0.140 (1.06)	0.231 (1.37)	0.089 (0.88)
Non-star Portfolios:			
HighStd-Large	0.341 (2.53)**	0.344 (2.13)**	0.275 (2.74)***
HighStd-Small	0.384 (2.36)**	0.369 (2.22)**	0.272 (2.55)**
LowStd-Large	0.123 (1.08)	0.223 (1.44)	0.115 (1.29)
LowStd-Small	0.125 (0.98)	0.222 (1.40)	0.119 (1.22)
Panel C: HighStd-Large-Star Portfolio - Other Portfolios			
Star Portfolios:			
HighStd-Small	0.136 (0.71)	-0.015 (-0.13)	-0.004 (-0.04)
LowStd-Large	-0.044 (-0.34)	-0.020 (-0.20)	-0.142 (-1.75)*
LowStd-Small	-0.184 (-1.21)	-0.252 (-1.47)	-0.230 (-2.24)**
Non-star Portfolios:			
HighStd-Large	0.156 (1.17)	0.093 (1.01)	0.045 (0.55)
HighStd-Small	0.200 (1.25)	0.118 (1.19)	0.042 (0.48)
LowStd-Large	-0.062 (-0.54)	-0.028 (-0.35)	-0.116 (-1.70)*
LowStd-Small	-0.059 (-0.47)	-0.029 (-0.33)	-0.111 (-1.43)

*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Table VII (A). Star-Creating Strategy and Family Performance: Annual Rebalancing

The table examines how cross-fund standard deviation and family size are related to family performance. We construct portfolios and performance measures in the same way as we do in Table VI(A). In panel A, the performance of HighStd Portfolios is compared to that of LowStd portfolios for all funds in the sample and separately for funds belonging to star and non-star families. In panel B, the performance of Large Portfolios is compared to that of Small portfolios for all funds in the sample and separately for funds belonging to star and non-star families. Panels C and D compare the performance of LowStd-Small portfolio and HighStd-Large portfolio to that of other portfolios. To check for robustness, we use alternative return measures (1-factor adjusted returns, 3-factor adjusted returns, and 4-factor adjusted returns) to identify star families and to measure portfolio performance. The t-statistics are in parentheses.

Portfolios	1-Factor Adjusted Returns	3-Factor Adjusted Returns	4-Factor Adjusted Returns
Panel A: HighStd Portfolios - LowStd Portfolios			
All Funds	-0.206 (-2.23)**	-0.076 (-1.16)	-0.159 (-2.63)***
Funds from Star Families	-0.175 (-1.24)	-0.012 (-0.12)	-0.183 (-2.13)**
Funds from Non-star Families	-0.170 (-1.81)*	-0.106 (-1.68)*	-0.128 (-2.06)**
Panel B: Large Portfolios - Small Portfolios			
All Funds	-0.006 (-0.06)	-0.007 (-0.11)	-0.011 (-0.19)
Funds from Star Families	-0.088 (-0.62)	0.019 (0.18)	-0.036 (-0.41)
Funds from Non-star Families	0.027 (0.29)	-0.013 (-0.22)	0.015 (0.24)
Panel C: LowStd-Small Portfolio - Other Portfolios			
HighStd-Large	0.202 (1.90)*	0.089 (1.20)	0.169 (2.46)**
HighStd-Small	0.214 (1.70)*	0.105 (1.44)	0.160 (2.25)**
LowStd-Large	0.002 (0.02)	0.021 (0.36)	0.013 (0.23)
Panel D: HighStd-Large Portfolio - Other Portfolios			
HighStd-Small	0.012 (0.09)	0.016 (0.19)	-0.010 (-0.13)
LowStd-Large	-0.200 (-2.18)**	-0.069 (-1.00)	-0.157 (-2.50)**
LowStd-Small	-0.202 (-1.90)*	-0.089 (-1.20)	-0.169 (-2.46)**

*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

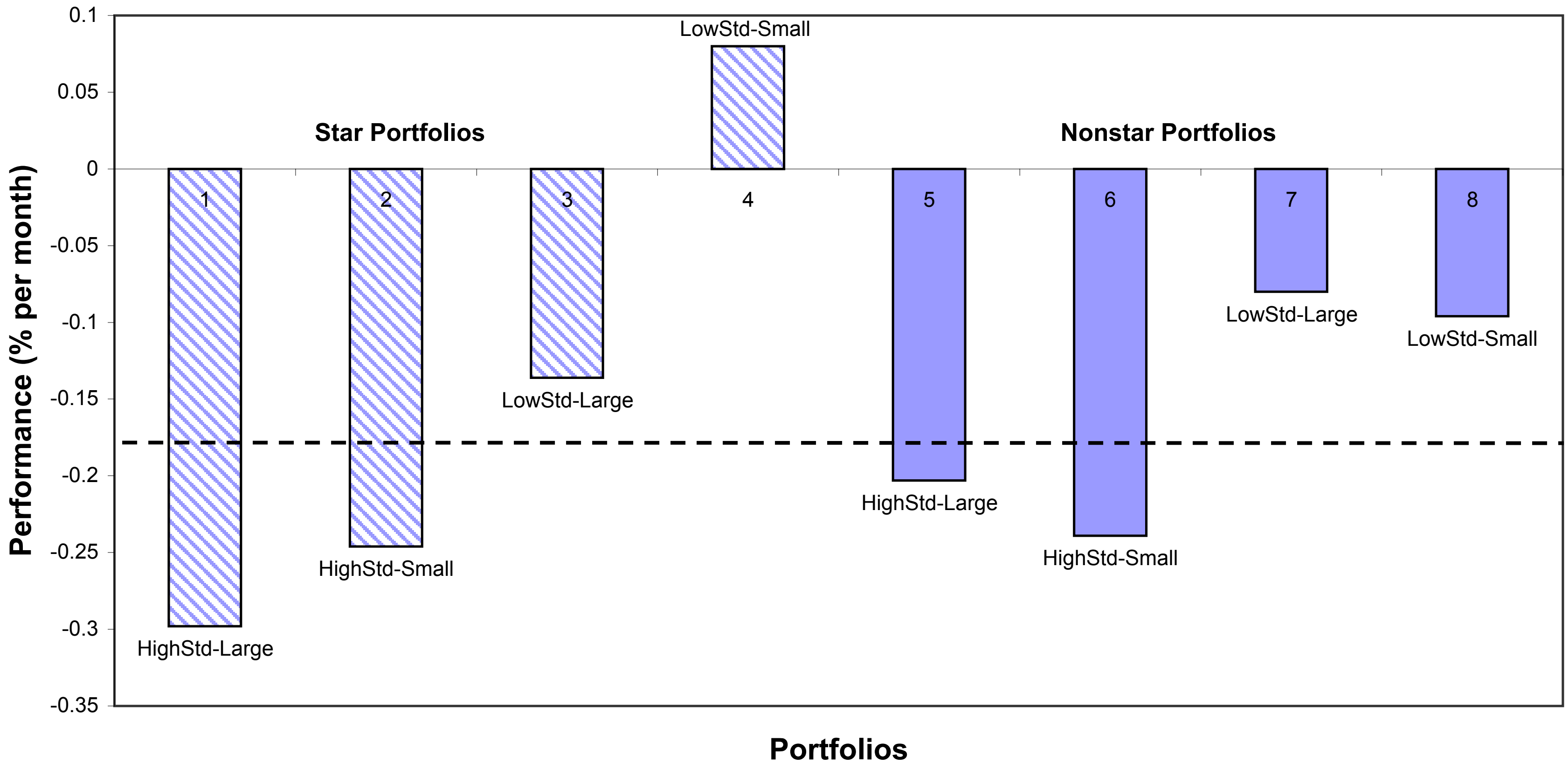
Table VII (B). Star-Creating Strategy and Family Performance: Monthly Rebalancing

The table examines how cross-fund standard deviation and family size are related to family performance. We construct portfolios and performance measures in the same way as we do in Table VI(B). In panel A, the performance of HighStd Portfolios is compared to that of LowStd portfolios for all funds in the sample and separately for funds belonging to star and non-star families. In panel B, the performance of Large Portfolios is compared to that of Small portfolios for all funds in the sample and separately for funds belonging to star and non-star families. Panels C and D compare the performance of LowStd-Small portfolio and HighStd-Large portfolio to that of other portfolios. To check for robustness, we use alternative return measures (1-factor adjusted returns, 3-factor adjusted returns, and 4-factor adjusted returns) to identify star families and to measure portfolio performance. The t-statistics are in parentheses.

Portfolios	1-Factor Adjusted Returns	3-Factor Adjusted Returns	4-Factor Adjusted Returns
Panel A: HighStd Portfolios - LowStd Portfolios			
All Funds	-0.197 (-2.12)**	-0.076 (-1.17)	-0.156 (-2.60)**
Funds from Star Families	-0.076 (-0.59)	-0.080 (-0.83)	-0.169 (-2.19)**
Funds from Non-star Families	-0.223 (-2.38)**	-0.124 (-1.97)**	-0.160 (-2.52)**
Panel B: Large Portfolios - Small Portfolios			
All Funds	0.024 (0.27)	0.008 (0.13)	-0.009 (-0.15)
Funds from Star Families	-0.004 (-0.03)	0.019 (0.19)	-0.037 (-0.43)
Funds from Non-star Families	0.011 (0.12)	0.017 (0.29)	0.001 (0.02)
Panel C: LowStd-Small Portfolio - Other Portfolios			
HighStd-Large	0.204 (1.96)*	0.091 (1.24)	0.174 (2.54)**
HighStd-Small	0.307 (2.37)**	0.140 (1.80)*	0.192 (2.55)**
LowStd-Large	0.021 (0.29)	0.023 (0.40)	0.023 (0.41)
Panel D: HighStd-Large Portfolio - Other Portfolios			
HighStd-Small	0.103 (0.74)	0.048 (0.57)	0.018 (0.24)
LowStd-Large	-0.183 (-2.01)**	-0.068 (-1.03)	-0.150 (-2.47)**
LowStd-Small	-0.204 (-1.96)*	-0.091 (-1.24)	-0.174 (-2.54)**

*** significant at the 1% level, ** significant at the 5% level, * significant at the 10% level

Figure 1: Average Monthly Four-factor Adjusted Returns for Portfolios of Star and Nonstar Families



The figure plots the monthly average four-factor adjusted returns for the eight portfolios reported in panel B of table VI(A). The first four portfolios consist of funds belonging to star families, and the last four portfolios consist of funds belonging to nonstar families. The dashed line represents the average monthly four-factor adjusted return for the TNA-weighted diversified portfolio.

------ Diversified Portfolio (-0.125% per month)