Price Matters: Spillover Effects of Fund Expenses on Funds in the Same Family

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Abstract

This paper investigates spillover effects of fund expenses on flows of other funds within the same mutual fund family. I show that fund expenses positively influence the flow-performance sensitivity and negatively influence flows of other funds in the same family. As fund expenses do not reduce fund returns of other funds in the family, these findings suggest that investors perceive fund expenses not only as a reduction of returns, but separately as the price of asset management. As a result, cheap funds attract fund flows and performance-insensitive investors to the fund family. Furthermore, the existence of a cheap fund in the family decreases flow-performance sensitivity of other funds by around 25% and increases flows in other funds by around 30%. At the family-flow level, having a cheap member fund decreases flow-performance sensitivity, even after controlling for the average fund expense ratio in the family. The results are important for mutual fund families which set fund expenses: fund expenses are a crucial factor for investors to make investment decisions, and it influences flows of all funds in the fund family.

JEL-Classification Codes: G11, G23, G41

Keywords: Fund Expenses, Fund Flows, Spillover Effects within Fund Families

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1 Introduction

Mutual fund families play a major role in financial markets and have become a crucial provider of financial assets for households. According to the Investment Company Institute, 56.2 million households in the US owned mutual funds in mid-2017, and net flows to mutual funds amount to $230 billion in the past decade.[1] Therefore, the previous literature shows a strong interest in understanding investment decisions of mutual fund investors. However, most studies only focus on how investors react to the performance of mutual funds, but how investors perceive and react to expenses of mutual funds is relatively less studied.[2]

There are two ways in which investors may perceive and respond to fund expenses. First, investors may simply regard fund expenses as a reduction of fund's returns. This is how the previous mutual fund literature usually interprets fund expenses. For example, Barber et al. (2005) argue that fund expense ratios reduce net returns and become invisible to investors because they may be easily masked by the volatile net returns reported by mutual funds. Second, fund investors may separately perceive fund expenses as the price of mutual funds, i.e., the price investors pay for asset management. Investors who choose funds with low expenses may be less sensitive to fund performance due to the following reasons. Given the same level of past net returns, fund investors interpret higher expenses as higher gross returns, and thus, better fund management skills. In addition, investors may also perceive a higher fund fee as better management skills because consumers tend to infer unknown quality (in this case, future fund performance) from the price, according to the economic and marketing literature (Wolinsky (1983), Shugan (1984), Monroe and Dodds (1988), Bagwell and Riordan (1991) and Kirmani and Rao (2000)). Therefore, when investors pick a cheaper fund and thus do not pay much for asset management, they may expect lower fund

[1] See Investment Company Institute 2018 investment company fact book, see `https://www.ici.org/pdf/2018_factbook.pdf`.

[2] Christoffersen et al. (2014) provides a literature review on mutual fund flows. The authors spend the entire Section 2 to discuss the relation between flows and performance while they only mention the price of funds as one of the other factors influencing fund flows in Section 3. This imbalance in the discussions demonstrates that there are fewer studies on the effect of fund expenses on fund flows, compared to those on the effect of fund performance on fund flows.

performance and won't bother to constantly track past fund performance to update their portfolio accordingly. For similar reasons, investors intending to choose a cheap fund may require a lower level of fund performance to make an investment than investors intending to put money in an expensive fund.[3] In this case, flows in cheap funds are less sensitive to past fund performance.

Most funds belong to fund families. Investing in funds of one fund family saves extra costs and is related to better service (e.g., Massa (2003), Nanda et al. (2004), and Kempf and Ruenzi (2008)). Fund families may be perceived as retail stores that offer diversified products, i.e., mutual funds with different investment objectives and share classes. The marketing literature documents spillover effects caused by prices observed in a retail store. For instance, Mulhern and Padgett (1995) show that price promotion of one product increases regular price purchases of other products in the same store. In this paper, I investigate whether there is an intrafamily spillover effect in terms of fund expenses, and specifically, whether fund expenses influence flows of other funds in the same fund family. The spillover effect of expenses may exist because, for example, fund families actively advertise their cheap funds to attract price-sensitive and performance-insensitive investors. These investors may also buy other funds in the family due to the cost benefits of investing in one fund family. It is also possible that investors perceive other funds in a fund family with cheap funds under management as a bargain, without further examination of the prices of comparable funds in other families. I conjecture that cheap funds attract extra fund flows and performance-insensitive investors to the fund family. Thus, low expenses of a fund in a given fund family increase fund flows and decrease the flow-performance sensitivity of other funds in the same fund family. The advantage of studying the spillover effect of fund expenses on fund flows in the same fund family is that it helps to understand how people perceive and react to fund expenses. As fund expenses do not directly decrease fund returns of other funds in the

[3]In a similar vein, Huang et al. (2007) argue that new investors encounter participation costs when deciding to invest in a new fund. In this paper, both existing and new cheap fund investors are less sensitive to fund past performance. Potential and existing cheap fund investors do not react to fund performance because they do not bother to collect the information or they do not care much about the cheap investment even if they are fully informed about past performance.

same family, it is possible to examine whether investors perceive fund expenses separately as the price of a fund, not just as reductions of its returns.

I use U.S. open-end mutual fund data from the CRSP Survivor-Bias-Free US Mutual Fund database for the time period from 1992 to 2017, during which all necessary information on fund families is available. My analysis is conducted at the share class level because fund expenses are different across share classes. I define the relative fund price as the expense rank within the same share class and the CRSP investment objective (the constructed expense rank). In addition, I also use the Morningstar expense rank (MS expense rank) which is available to investors on the Morningstar website. In the next step, I run a regression of fund flows on relative expenses of a fund under consideration and other funds in the same fund family, controlling for other factors that influence fund flows and flow-performance sensitivity. My regressions also include time and share class times investment objective (or even fund) fixed effects.

The results show that there are spillover effects of fund expenses on fund flows of other funds in the same fund family. Specifically, flows are more sensitive to past fund performance if other funds in the fund family have a higher expense. After controlling for the sensitivity to fund performance, fund flows of other funds in the family decrease with the expenses. The results are also economically significant: an increase of 0.2 (a quintile) in fund expenses increases the flow-performance sensitivity of other funds in the family by 7% to 17% and decreases flows of other family member funds by around 25% relative to average fund flows in the sample.

If low expenses of a given fund attract more flows in other funds of the same family, one may wonder why fund families do not offer cheap funds only. However, low prices also reduce the revenue of the fund family. Thus, it may be optimal for a fund family to offer only a few cheap funds to generate spillover effects to other funds under its management. Therefore, I also examine whether having a cheap fund in the fund family has a spillover effect on flows of non-cheap funds. A cheap fund is defined as belonging to the bottom quintile in

the constructed expense rank or the Morningstar expense rank.[4] My results show that the existence of a cheap fund in the family decreases flow-performance sensitivity of other funds by around 25% and increases flows of other funds by around 30%. On the family flow level, the existence of a cheap fund decreases flow-performance sensitivity even after controlling for the average fund expense ratio in the family.

I consider several alternative explanations for my findings. Firstly, expenses are used as a measure of marketing efforts in Sirri and Tufano (1998) and Huang et al. (2007). If a high-expense fund has intensive marketing and makes its fund family more visible to investors, the marketing may increase flow-performance sensitivity of other funds in the fund family. Secondly, D. P. Brown and Y. Wu (2016) document that fund flows are positively influenced by the performance of other funds in the same family because there is cross-fund learning about investment abilities. It is possible that high expenses of other funds in the family lead to a worse performance of these funds and the worse performance decreases fund flows. At last, Nanda et al. (2004) document that star funds in the family increase flows of other member funds and large fund families tend to have star funds. Large fund families are also likely to offer cheap funds due to economies of scale (Warner and J. S. Wu (2011) and Khorana and Servaes (1999)). Besides, cheap funds are more likely to be a performance star because Nanda et al. (2004) consider after-fee returns. It is possible that the spillover effect of cheap funds on flows of other funds in the same family is driven by the spillover effect of the star phenomenon on fund flows found in Nanda et al. (2004). To address these alternative explanations, I rerun the analysis after controlling for additional measures from the literature. I find that none of these alternatives eliminates the patterns of fund flows and flow-performance sensitivity this paper documents.

This paper contributes to several strands of the literature. First, the paper contributes to the understanding of how mutual fund investors perceive fund expenses. Previous literature has documented that fund expenses influence fund flows. Sirri and Tufano (1998) find that fund

[4]The concept of a cheap fund is similar to a star fund in papers studying the mutual fund performance (Nanda et al. (2004)) and Del Guercio and Tkac (2008)).

expenses decrease fund flows and increase flow-performance sensitivity in well-performing funds, while Barber et al. (2005) show that flows are negatively influenced by loads, but not expenses, due to the salience of loads as in-your-face costs. Some studies also use expenses as a measure for marketing efforts or distribution compensates, which decrease search costs and participation costs of investors (Sirri and Tufano (1998) and Huang et al. (2007)). Unlike the previous literature on fund expenses, I focus on the spillover effect of fund expenses on flows of funds within the same fund family. In this way, I separate the influence of fund expenses as prices of funds from the influence of fund expenses as reductions in net returns.

Furthermore, the paper contributes to mutual fund studies on the importance of family membership. The product policies of mutual fund families, such as product differentiation and price competition, influence fund performance and fund flows (Siggelkow (2003), Massa (2003), and Khorana and Servaes (2011)). Guedj and Papastaikoudi (2003) and Gaspar et al. (2006) show that fund families are able to shift performance across funds under management by, for example, allocating underpriced initial public offering or better management talent to a fund. Warner and J. S. Wu (2011) explore advisement contract changes and find that fund fees increase if other funds in the fund family perform well. In addition, investment decisions are influenced by other funds in the same fund family. Specifically, fund flows increase if there is a stellar fund in the family (Nanda et al. (2004)) and if the funds perform better compared to other funds in the family (Kempf and Ruenzi (2008)). In this paper, I document that fund expenses positively influence the flow-performance sensitivity of other funds in the same fund family. Besides, I find that the existence of a cheap fund has a positive spillover effect on flows in other funds of the same fund family.

More generally, my findings also add to the literature on the investment behavior of mutual fund investors. Plenty of studies find that fund flows increase after good fund performance (e.g., Berk and Green (2004), Sapp and Tiwari (2004), and Ivković and Weisbenner (2009) and the flow-performance relation is convex (e.g., Chevalier and Ellison (1997), Sirri and Tufano (1998), Lynch and Musto (2003) and Huang et al. (2007)). Besides, there are several

related studies debating on whether fund flows are "smart money" (e.g., Gruber (1996) and Zheng (1999)) or "dumb money" (e.g., Frazzini and Lamont (2008)). This paper focuses on the price dimension of mutual funds and studies its spillover effects in a fund family.

Finally, this paper contributes to a broader literature in economic and marketing on the relationship between price and quality. In a similar vein, previous literature in marketing finds that buyers of high-quality goods are less price-sensitive compared to those of low-quality goods (Oren et al. (1982), Krishnamurthi et al. (1992), and Erdem et al. (2002)). The effect of the price of a fund on its flow-performance sensitivity found in this paper is also consistent with the assertions about the price premium in Shapiro (1983) and Rao and Monroe (1996): products with a higher quality charge a price premium and consumers who purchase these products tend to be quality-sensitive. Note that Gil-Bazo and Ruiz-Verdú (2009) find a negative relationship between contemporaneous fund fees and fund performance. This does not contradict with the findings in this paper, because fund fees increase flow-performance sensitivity, as long as investors who pay high fund fees expect better fund performance and care more about past performance.

The paper is most closely related to Nanda et al. (2004). The authors show that the stellar performance of a fund has a positive spillover effect on flows of other funds in the same fund family. While Nanda et al. (2004) focus on stellar performance, this paper studies the spillover effect of cheap funds on fund flows. My results are robust even after controlling for the star phenomenon found in Nanda et al. (2004). It means that the price dimension of funds is very important for mutual fund investors to make investment decisions.

The paper has practical implications for fund families to set prices for their member funds. Performance-insensitive investors do not frequently change their investment positions, leading to less volatile fund flows. Liquidity-motivated tradings (Edelen (1999) and Alexander et al. (2006)) and highly volatile flows (Rakowski (2010)) are harmful to fund performance. Therefore, mutual funds have motivations to gain performance-insensitive investors to achieve better performance, which helps attract more flows. Accordingly, a fund family

benefits from providing a few cheap funds, which attract performance-insensitive investors to other funds in the same fund family as well.

2 Data and summary statistics

2.1 Data and sample selection

The primary data are from the CRSP Survivor-Bias-Free US Mutual Fund Database, which covers monthly returns, expense ratios, total net assets, fund name, fund family name etc. I further collect the share class[5], Morningstar Category, and the Morningstar expense rank from Morningstar Direct.[6] The sample consists of all open-end U.S. mutual funds from January 1992 to December 2017. Institutional investors and retails investors are heterogeneous investment groups. This paper aims to figure out how retail investors perceive expenses and I expect that spillover effects of fund expenses on fund flows in fund families are larger for retail investors because they are more likely to be influenced by advertisements on cheap funds and do not spend enough efforts to study fund expenses by comparing with other similar funds in different fund families. Therefore, in this paper, I consider only retail funds. In addition, the analysis in this paper is conducted at the share class level because different share classes have different fee structures and charge expenses at different levels (e.g., Reid and Rea (2003) and Nanda et al. (2009)).[7] If not explicitly pointed out, funds in this paper refer to the share class level.

[5]I combine information on share classes from the Morningstar Direct and fund names in the CRSP mutual fund database.

[6]Morningstar Direct only covers a snapshot of the Morningstar expense rank so I calculate the Morningstar expense rank for the whole sample following the Morningstar methodological documentation (`https://morningstardirect.morningstar.com/clientcomm/Morningstar_Fee_Level_for_Funds_Methodology.pdf`).

[7]Studies on mutual funds usually accumulate share classes to the portfolio level to avoid the double counting problem (e.g., Nanda et al. (2004) and Gaspar et al. (2006)). Using each share class as a separate fund does not generate the problem in this paper since the main focus is fund flows and expense ratios. Some previous studies also treat each share class as a separate fund, e.g., Gil-Bazo and Ruiz-Verdú (2009), Huang et al. (2007), and Franzoni and Schmalz (2017).

Funds are included in the sample if fund family name, the expense ratio for a given month, investment category (defined as the same CRSP investment objective[8] and share class or the same Morningstar Category and distribution channel) are available. Furthermore, I exclude the share classes for institutional investors, small fund families with less than $10 million total net assets and less than five funds, and small funds with less than $5 million total net assets.[9] The final sample consists of 2,902,458 monthly share class observations, including 692 distinct fund families and 28,311 funds with different share classes.

2.2 Construction of main variables

Definition of an expense rank and a cheap fund

Mutual fund fees usually consist of loads, which are charged once at the beginning of the investment (front loads) or at the end of the investment (back-end loads), and expense ratios, which are charged as an annual percentage of the investment. Sirri and Tufano (1998) calculate total expenses by adding front loads divided by seven (the average investment horizon of mutual funds in years) to the expense ratio. In this paper, I follow the Morningstar fee level methodology and define expense rank by comparing the expense ratios within the same investment categories. The motivation to use expense ranks is to capture how investors perceive the level of fund expenses compared to other similar funds available. According to psychology and economic literature (e.g., the rank-dependent or cumulative functional by Quiggin (1982) and Schmeidler (1989), and the cumulative representation of uncertainty by Tversky and Kahneman (1992)), ranking is important for decision making. The reason to focus on expense ratios instead of loads is that fund expense ratios are charged every year as long as investors receive asset management service from funds. Therefore, compared to loads, on-going fund expense ratios are closer to the intuition of prices of asset management.

[8]CRSP investment objective combines style and objective codes from Wiesenberger, Strategic Insight, and Lipper. Funds in the sample are attributable to one of the following categories: EDCI, EDCL, EDCM, EDCS, EDS, EDYB, EDYG, EDYH/S, EDYI, EF, I, IC, IF, IG, IM, IU, M, and O.

[9]Including institutional investors or small fund families and funds does not significantly change the results.

In addition, when the expense ranks are calculated by comparing within similar funds, the information on the fee structure, i.e., whether a fund charges front loads or deferred loads, is absorbed in the investment category classification.[10]

The investment categories, within which the expense levels are compared, are defined in two ways. First, I define the investment category as the same share class and CRSP investment objective. In addition, I define the investment category by closely following the Morningstar fee level methodology: the same distribution channel and Morningstar category. In this way, I calculate the MS expense rank, which is presented to investors as the cost dimension in the Morningstar fund analysis.

Figure 1 plots the fund flows against the expense ratios (Panel A) and expense ranks (Panel B and Panel C). Fund flows are negatively correlated with expense ratios if funds have an expense ratio below 1% while they are positively related to expenses if expense ratios are between 1% and 2%. The flow-expense relationship becomes flat if expense ratios are higher than 2%. The linear prediction plot demonstrates a positive relationship between fund flows and fund expense ratios. In contrast, the relationship between fund flows and the constructed expense rank shows a clear negative pattern (Panel B). Besides, flows in funds with an expense rank lower than 0.4 are more sensitive to the expense rank. The shape is similar to the non-linear demand curve: the same price increase leads to a stronger decrease in quantity when prices are lower. Similarly, Gil-Bazo and Ruiz-Verdu (2008) and Gil-Bazo and Ruiz-Verdú (2009) argue that funds with high fees extract rents from unsophisticated investors. Thus, investors choosing cheaper funds are more sophisticated, and therefore, they may be more sensitive to the fund price. When the MS expense rank is used, there is a similar pattern in the flow-expense rank relationship. However, when the MS expense rank is high, it has a positive relationship with fund flows. The overall linear relationship between both expense rank measures and fund flows is negative. In summary, Figure 1 shows that the expense rank establishes a more valid comparison between different funds at the share

[10]Using ranking on total expenses calculated following Sirri and Tufano (1998) or controlling for the load amount separately in all regressions does not materially change the results.

class level than the raw expense ratio. It suggests that investors compare fund prices within investment objectives and distribution channels (e.g., the share class) when making fund investment decisions.

In the next step, I construct a dummy variable labeled "Cheap fund" to capture the salience of fund expenses. Bordalo et al. (2012) argue that salient payoffs and rankings catch people's attention. Consistent with the salience effect, Del Guercio and Tkac (2008) find that funds with the top Morningstar performance rank attract significantly more flows and Nanda et al. (2004) document a spillover effect on flows generated by stellar funds in a fund family. In this paper, Cheap fund is equal to one if the fund expense is ranked in the bottom quintile of the same investment category. Again, the investment category is defined in two ways: the same share class and CRSP investment objectives, and the same Morningstar category and distribution channel. When "Cheap fund" is defined using the MS expense rank, the definition of a cheap fund is equivalent to the fee level of "low" assigned by Morningstar.[11]

Fund flows and fund family flows

Following previous literature (e.g., Sirri and Tufano (1998) and Lou (2012)), I calculate the dollar flows to fund i in month t as

$$Dollar\,Flows_{i,t} = TNA_{i,t} - TNA_{i,t-1} \times (1 + R_{i,t}) - Merger_{i,t}, \tag{1}$$

where $TNA_{i,t}$ is the total net assets, $R_{i,t}$ is the monthly returns and $Merger_{i,t}$ is the increase in TNA due to fund mergers.

Fund flows used in the analysis are dollar flows in a fund normalized by TNA at the end of the previous month:

$$Fund\,Flow_{i,t} = \frac{DollarFlow_{i,t}}{TNA_{i,t-1}}. \tag{2}$$

[11] According to Morningstar, a percentile rank below 20% is "low", between 20% and 40% is "below average", between 40% and 60% is "average", between 60% and 80% is "above average", and above 80% is "high".

Following Nanda et al. (2004), the family-level flow of fund family f containing n funds is computed as

$$Family\,Flow_{f,t} = \frac{\sum_{i=1}^{n} DollarFlow_{i,t}}{\sum_{i=1}^{n} TNA_{i,t-1}}. \tag{3}$$

Fund performance

Several mutual fund papers use the CAPM alpha, the Fama-French three-factor alpha (Fama and French (1993)), or the four-factor alpha with the momentum effect (Carhart (1997)) as measures for fund performance in the sample of diversified equity funds (e.g., Nanda et al. (2004) and Barber et al. (2016)). In this paper, the sample covers all funds since fund performance is not the main focus of the paper.[12] Therefore, I use fund returns adjusted for the average returns of funds in the same CRSP investment objectives to measure fund performance. The funds are at the share class level so I also adjust for share classes when calculating the adjusted returns. I rank the monthly adjusted returns in the previous 12 months to get the performance rank of a fund and use the rank as a measure for performance in my analysis. The family performance rank is the value-weighted average of performance ranks of all funds in the family.

All other variables are described in detail in Appendix A.

2.3 Summary statistics

Table 1 reports summary statistics of the main variables used in my analysis. Panel A reports variables on the fund level and Panel B reports variables on the fund family level. The average expense ratio of all funds in the sample is 1.22%. The average monthly flow of mutual funds is 0.81% and the average family flow is lower at 0.27%. The reason for the difference between fund flows and family flows is that the funds are at the share class level

[12] In unreported analysis, I restrict the sample to only diversified equity funds and use the Carhart 4-factor alphas to measure fund performance. The main results do not materially change.

with relatively small TNA and families in the sample have very large TNA which scales down family flows expressed in percentage. The average number of funds in a family is 48, which is higher compared to Nanda et al. (2004) because my analysis is at the share class level and small families are excluded.

Appendix C presents piecewise correlations between all variables. They show that multicollinearity should not be an issue in the regressions. The constructed expense rank and the Morningstar expense rank are positively and significantly correlated with a coefficient of 0.685.

3 Spillover effects of fund prices on flows and flow-performance sensitivity in the fund family

3.1 The effect of the expense rank of other funds in the fund family on fund flows and flow-performance sensitivity

I start by examining whether fund expenses influence flows in funds of the same fund family. As mentioned, a spillover effect exists if investors perceive other funds in fund families that offer funds with low expenses as a bargain without further comparing them to prices of similar funds in other fund families. It is also possible that performance-insensitive investors attracted by cheap funds in the family invest in other funds in the same fund family due to cost efficiency. Thus, low expense ranks of other funds in the same family are expected to decrease flow-performance sensitivity and increase flow levels.

To get an overview of the influence of expenses of other funds on fund flows, Figure 2 plots the relationship between fund flows and performance with different levels of average expense ranks of other funds in the same fund family. In Panel A, expense ranks are defined by comparing expense ratios in the same CRSP investment objective and share class, while in Panel B, I use MS expense ranks. No matter which expense rank measures I use, the blue

line, which represents funds that have other member funds in the same fund family with an average expense rank in the bottom tertile, has the flattest slope. When past performance is low, the blue line is above the level of fund flows of the other two fund groups with more expensive funds in the fund families. Although the flow-performance relationships presented in Figure 2 are consistent with my hypothesis, the observations need to be interpreted with caution, as I have not controlled for any other fund characteristics that also have effects on fund flows and flow-performance sensitivity.

To further test the spillover effect, I estimate the following fixed-effect panel regression with time-varying control variables that may influence fund flows and flow-performance sensitivity:

(4)

$$
\begin{aligned}
Fund\,flow_{i,t} = {} & \alpha + \beta_1 Average\,expense\,rank\,of\,other\,funds_{i,t-1} \times Fund\,performance_{i,t-1} \\
& + \beta_2 Expense\,rank_{i,t-1} \times Fund\,performance_{i,t-1} + \beta_3 Fund\,performance_{i,t-1} \\
& + \beta_4 Average\,expense\,rank\,of\,other\,funds_{i,t-1} + \beta_5 Expense\,rank_{i,t-1} \\
& + \beta_6 Attrition_{i,t-1} \times Fund\,performance_{i,t-1} + \beta_7 Attrition_{i,t-1} + \beta_8 Fund\,age_{i,t-1} \\
& + \beta_9 Fund\,age_{i,t-1} \times Fund\,performance_{i,t-1} + \beta_{10} Family\,size_{i,t-1} \\
& + \beta_{11} Family\,size_{i,t-1} \times Fund\,performance_{i,t-1} + \beta_{12} Fund\,size_{i,t-1} \\
& + \beta_{13} Fund\,return\,volatility_{i,t-1} + \beta_{14} Fund\,Turnover_{i,t-1} + u_i + v_t + \varepsilon_{i,t},
\end{aligned}
$$

where i is the index for each fund at the share class level and t represents a given month. The dependent variable, *Fund flows*$_{i,t}$, is calculated as in Equation 2. *Average expense rank of other funds*$_{i,t-1}$ takes the average of expense ranks of all other funds in the same fund family. As defined in Section 2.2, *Expense rank*$_{i,t-1}$ is constructed by comparing fund expense ratios within the same investment objective and *Fund performance*$_{i,t-1}$ is measured by the ranking of the accumulated monthly returns adjusted for investment category in the previous 12 months, standardized between 0 and 1.

I include various fund and family characteristics as control variables. Fund expenses influence fund flows and flow-performance sensitivity (Sirri and Tufano (1998) and Huang et al. (2007)). Thus, *Expense rank* and its interaction with *Fund performance* are included in the regression so that β_1 and β_4 solely capture the spillover effect of expenses on flow-performance sensitivity and flows of other funds in the same fund family. I also include an attrition measure, fund age, as well as their interactions with past fund performance because the previous literature (Chevalier and Ellison (1997), Christoffersen and Musto (2002) and Christoffersen and Xu (2017)) shows that attrition and fund age influence fund flows and flow-performance sensitivity. Furthermore, D. P. Brown and Y. Wu (2016) find that family size reduces investors' sensitivity to fund performance. I control for *Family size*, measured by the log of family TNA, to make sure that the effect of expenses on fund flows of other funds in the family is not caused by family size and economies of scale.[13] *Fund size*, *Fund return volatility*, and *Fund turnover* are included as control variables in order to capture how investors react to the size of the fund, its riskiness, and the fund's trading activity. A more detailed definition of all variables is contained in Appendix A. All models include time fixed effects and investment category (share class $\times$ CRSP investment objective) fixed effects or fund fixed effects to control for potential time trends in fund flows and unobserved time-invariant characteristics of investment categories and funds. Standard errors are clustered by fund and time.

Table 2 reports the regression results. In columns (1) to (3), I define expense ranks by comparing fund expenses within funds with the same share class and CRSP investment objective. In columns (4) to (6), I follow the Morningstar methodology to define expense ranks. Across all model specifications, the impact of the average expense rank of other funds in the fund family on flow-performance sensitivity is positive and statistically significant at the 1% level. Depending on the expense rank measure and the model specification, the estimates show that if the average expense rank of other funds in the fund family increases

[13] Using the number of funds in a fund family as a measure for fund family size does not materially change my baseline results. The number of funds in a family negatively influences flow-performance sensitivity. The effect is statistically significant, which is consistent with findings in D. P. Brown and Y. Wu (2016).

by 0.2, i.e., one quintile, the flow reaction to past fund performance will increase by around 0.306 (1.532×0.2) to 0.359 (1.796×0.2). The effect is economically meaningful. Relative to the baseline performance sensitivity, this effect corresponds to 7% to 17% higher flow-performance sensitivity.

In addition, the average expense rank of other funds in the fund family decreases fund flows after taking out its effect on flow-performance sensitivity. The coefficient estimates of the average expense rank of other funds in the fund family on fund flows are negative and statistically significant at the 1% level in most model specifications. The overall effect of the average expense rank of other funds on fund flow levels depends on past fund performance. Specifically, in Column (1), for example, if the past performance rank of a fund is below 59.7% (1.010/1.692), the average expense rank of other funds has a negative effect on the fund flows. However, if the fund has performed well, the more expensive the other funds in the family are, the more flows are attracted to the fund.

Consistent with the previous literature (e.g., Sirri and Tufano (1998)), funds' own expense rank increases flow-performance sensitivity and decreases the flow level. Gil-Bazo and Ruiz-Verdú (2009) argue that the more insensitive the investors are to past fund performance, the higher the fees a fund sets, which implies a negative relationship between fund expenses and the flow-performance sensitivity. The inconsistency in the results may be explained by the difference in the flow-performance sensitivity measures. Gil-Bazo and Ruiz-Verdú (2009) use the attrition measure (Christoffersen and Musto (2002) and Christoffersen and Xu (2017)), fund age, and fund size to calculate a proxy for the flow-performance sensitivity while in this paper, I control for all these factors and directly measure flow-performance sensitivity in the model. In order to test this, I use attrition as a time-varying measure for the fund flow-performance sensitivity as suggested by Christoffersen and Musto (2002) and Christoffersen and Xu (2017) and run a regression of the attrition measure on the expense rank of a fund and the average expense ranks of all other funds in the same fund family (Appendix E). According to Christoffersen and Musto (2002) and Christoffersen and Xu (2017), the higher

the attrition is, the lower the flow-performance sensitivity because the attrition represents self-selection in investors' performance sensitivity: the more investors left the fund, the less performance sensitive the remaining investors are. In Table 2, I also find that the coefficient estimates of the interaction terms between the attrition and fund performance are negative and statistically significant. Results in Appendix E show that fund expenses increase attrition so it decreases flow-performance sensitivity, which is consistent with Gil-Bazo and Ruiz-Verdú (2009). However, the results on the expense rank of other funds in the family are the same as the main findings of this paper: it is negatively related to the attrition measure and thus, it increases flow-performance sensitivity of the fund under consideration.

Coefficient estimates of other control variables on fund characteristics are also in line with expectations. Consistent with findings in Chevalier and Ellison (1997), fund age decreases flow-performance sensitivity and flows after controlling for fund fixed effects. Fund flows decrease with the level of fund return volatility because investors avoid investing in funds with high risks. Fund size also decreases fund flows while family size and turnover increase fund flows.

So far, the model only regards the flow-performance relationship as linear and demonstrates the effect of expenses on fund flows of other funds in the same fund family. According to Sirri and Tufano (1998) and Huang et al. (2007), however, the flow-performance sensitivity is non-linear[14] and fund expenses have different effects on flow-performance sensitivity at different levels of performance. In Figure 2, a non-linear flow-performance relationship is also observed. Thus, I estimate piecewise linear regressions by defining a fractional rank for funds in the bottom performance quintile, middle three performance quintiles, and the top performance quintile to examine how expenses influence flow-performance sensitivity at

[14]Earlier studies on the non-linear relationship between flows and performance include e.g., Ippolito (1992) and Carhart (1997). Chevalier and Ellison (1997) and K. C. Brown et al. (1996) examine whether the non-linear flow-performance relationship increases fund managers' motivation to take more risk. However, Spiegel and Zhang (2013) claim that the convexity in the flow-performance relationship is likely to be misspecification of empirical models. This paper does not intend to take a stand on this debate but I show that the non-linear specification does not influence the main results.

different levels of fund performance. Other control variables and interaction terms are the same as in Equation 4.

Results in Table 3 indicate that the average expense rank of other funds in the same fund family has a positive effect on flow-performance sensitivity at all levels of performance, which is statistically significant at least at the 10% level. When compared with the baseline flow-performance sensitivity at each level of performance, even the smallest effect in the middle performance quintiles is economically significant (e.g., 0.660/2.465=27% in Model (2)). After controlling for piecewise flow-performance sensitivity, both fund expenses and expenses of other funds in the family decrease fund flows. Expenses of other funds have a larger and more robust negative influence on the fund flows: a quintile increase (0.2) in other fund expense rank will lead to around 17% to 30% decrease in fund flows, which is around half of the average fund flows in the sample.

Fund expenses do not influence the fund returns of other funds in the same family. However, they increase fund flows and decrease flow-performance sensitivity of other funds in the same family. This provides evidence on how investors perceive fund expenses: they regard fund expenses as the price of asset management and funds with a low price attract more flows and performance-insensitive investors. These investors put money into other funds in the family as well, which generates the spillover effects of fund expenses on fund flows. Therefore, fund expense ratios are very important for investors to make their investment decisions. They influence the fund flows in all funds in the fund family.

Given the empirical results on the spillover effect of fund expenses on fund flows in the same fund family, fund families should keep in mind that expense ratios are not able to be hidden in the net returns since investors perceive them as prices of funds. It makes sense to keep the price low to attract more flows and decrease flow-performance sensitivity of member funds. It is obviously beneficial for funds to attract fund flows because flows increase the total net assets of fund families, which is the basis to charge expenses. In addition, performance-insensitive investors do not frequently change their investment positions, leading to less

volatile fund flows. Rakowski (2010) document a negative relationship between the volatility of daily fund flows and fund risk-adjusted performance. Furthermore, Edelen (1999) and Alexander et al. (2006) show that liquidity-motivated tradings harm fund performance. Therefore, fund families also have motivations to attract performance-insensitive investors because less volatile flows lead to better fund performance, which helps to attract more flows to the fund families.

3.2 The effect of cheap funds on flows and flow-performance sensitivity of other funds in the fund family

Even if I find that fund expenses decrease flow-performance sensitivity of other funds in the same fund family, it is not clear whether fund families are willing to set a low fund price for all member funds. Low fund expenses attract flows and performance-insensitive investors, but they also decrease the revenues of fund families. Investors may be attracted by extreme ranks and values when making financial decisions (e.g., Del Guercio and Tkac (2008) and Bordalo et al. (2012)). It is interesting to further examine whether the existence of a cheap fund in the fund family has a spillover effect on fund flows. If so, fund families can attract more flows and decrease flow-performance sensitivity by only having some cheap funds under management, instead of setting all fund expenses to be low.

In order to test the effect of the existence of a cheap fund, I define a dummy variable called *Cheap fund in family*$_{i,t-1}$, which is equal to one if the fund is not cheap but belongs to a fund family with at least one cheap fund. Funds are recognized as a *Cheap fund* if their expense ratios are in the bottom quintile of the same investment category. A detailed definition of *Cheap fund* is explained in Section 2.2.

I re-estimate the fixed effect panel regressions presented in Equation 4 by substituting *Average expense rank of other funds*$_{i,t-1}$ with *Cheap fund in family*$_{i,t-1}$, and substituting *Expense rank*$_{i,t-1}$ with *Cheap fund*$_{i,t-1}$. The control variables remain the same in all regressions. Additionally, I add *Expense ratio*$_{i,t-1}$, *Family expense*$_{i,t-1}$ (value-weighted average of

fund expense ratios in the fund family), and their interaction terms with past performance as control variables to capture the marginal effect of being a cheap fund on fund flows. Time fixed effects and investment category or fund fixed effects are included in the regressions. Standard errors are clustered by fund and time.

Table 4 presents the results. The existence of a cheap fund in the fund family decreases flow-performance sensitivity.[15] The decrease is statistically significant at the 1% level in all models and amounts to 26% to 31% of the baseline flow-performance sensitivity.

After taking out the influence of cheap funds on flow-performance sensitivity, the existence of a cheap fund in the family has a positive spillover effect on fund flows. The coefficients of the *Cheap fund in family* dummy are positive and statistically significant at the 1% level when the models control for investment category fixed effects or fund fixed effects. In economic terms, the increase generated by the existence of a cheap fund in the fund family is about half of the average fund flows in the sample (0.812% in Table 1). If the flow-performance relationship is taken into account, the existence of a cheap fund in a family still decreases the fund flows: fund flows do not increase as much after good performance since investors are insensitive to past performance, so the overall effect of cheap funds in the family on fund flows is negative if the fund performs well.

Furthermore, I again estimate a piecewise linear model to consider the non-linearity in the flow-performance relationship. Similar to the results in the linear model, results in Table 5 show that the existence of a cheap fund decreases flow-performance sensitivity at all performance levels. The results with the constructed expense rank (Model (1)-(3)) are statistically significant at the 1% level when the funds' performance lies in the top quintiles. When the MS expense rank is used (Model (4)-(6)), the negative effect is statistically significant in the middle three quintiles. The positive effect of the existence of a cheap fund

[15] I also explore the effects of the existence of an expensive fund but do not find any robust result. Similarly, Mulhern and Padgett (1995) find that if there is a price reduction in one product, the demand for other products with normal price in the same supermarket also increase. The authors do not study the effect of a price increase in one product on the demand for other products.

in the fund family on the fund flows still remains at the same level after controlling for the non-linearity in the flow-performance relationship only if Morningstar ranking method is used. It is not surprising that results on fund flows are more robust when the Morningstar ranking is used because this expense rank is what investors observe when they search a fund on the Morningstar website.

3.3 Cheap fund effects on flow-performance sensitivity at the fund family level

So far, I only focus on the fund-level spillover effect of fund expenses on fund flows in the fund family. To explore what cheap funds bring to a fund family, I compare flows in families with a cheap fund to those in families without any cheap fund, after controlling for other family characteristics. Specifically, I estimate the following fixed effect panel regression:

$$
\begin{aligned}
Family\,flow_{f,t} &= \alpha + \beta_1 Cheap\,family_{f,t-1} \times Family\,performance_{f,t-1} \\
&+ \beta_2 Cheap\,family_{f,t-1} + \beta_3 Family\,performance_{f,t-1} \\
&+ \beta_4 Family\,size_{f,t-1} \times Family\,performance_{f,t-1} \\
&+ \beta_5 Family\,size_{f,t-1} + \beta_6 Family\,Expense\,Ratio\,f,t-1 \\
&+ \beta_7 Family\,Expense\,Ratio_{f,t-1} \times Family\,performance_{f,t-1} \\
&+ \beta_8 Family\,turnover_{f,t-1} + \beta_9 Number\,of\,investment\,objectives\,in\,family_{f,t-1} \\
&+ \beta_{10} Return\,dispersion\,in\,family_{f,t-1} + \beta_{11} Family\,front\,load_{f,t-1} + u_f + v_t + \varepsilon_{f,t},
\end{aligned} \tag{5}
$$

where f and t are indices for the fund family and the month, respectively. The dummy variable *Cheap fund in family*$_{f,t-1}$ indicates whether the fund family has at least one cheap fund under management or not. *Cheap fund* is the bottom quintile of the expense rank, as defined in Section 2.2. *Cheap fund in family*$_{f,t-1}$ dummy captures how the existence of a cheap fund influences the family flows and its interaction term with family performance indicates the influence of cheap funds in a family on flow-performance sensitivity at the

fund family level. *Family performance rank*$_{f,t-1}$ is measured as the value-weighted average of the performance rank in the previous 12 months of funds in the family.

Other control variables are similar to those used in previous studies. *Family size*$_{f,t-1}$ is measured by the log of family TNA and I further include the interaction term between family size and family performance. I control for *Family Expense Ratio*$_{f,t-1}$ and its interaction term with family performance to get the marginal effect of cheap funds in the family on flow-performance sensitivity and flows at the family level. *Family turnover*$_{f,t-1}$ measures how actively a family manages its funds. *Return dispersion in family*$_{f,t-1}$, the standard deviation of monthly returns of all funds in the fund family, and *Number of investment objectives*$_{f,t-1}$ capture the level of diversification within a fund family. *Family front load*$_{f,t-1}$ measures entry costs to invest in the fund family.[16]

Results are presented in Table 6. After adding the interaction term between the family expense ratios and family performance, the coefficient estimate of *Family performance* is no longer statistically significant. However, expense ratios in the sample are never zero[17], so family past performance always positively influences family flows and the influence is larger if the family expense ratio is higher. Conditional on a given level of family expense ratios, the existence of a cheap fund in a fund family decreases flow-performance sensitivity at the fund family level and the effect is statistically significant at the 1% or 5% level, depending on the model specification.[18] For example, for fund families with an average expense ratio of 1%, the existence of a cheap fund decreases the flow-performance sensitivity by about one third. In addition, the existence of a cheap fund in a family increases the family flow but the positive effect is only marginally statistically significant at the 10% level if the MS expense rank is used and the model controls for the fund family fixed effects.

[16]Using total loads instead of front loads does not change the results. The previous literature (e.g., Sirri and Tufano (1998) and Barber et al. (2005)) assumes that investors usually do not pay back-end loads.

[17]Zero percent expense ratios reported in the CRSP Mutual Fund database represent missing values (Barber et al. (2005)).

[18]I also examine the effect of the number of cheap funds in a fund family on family flows but find no significant results.

Table 6 also shows that flows in fund families are positively related to dispersion in returns of funds within the family and negatively related to family expense ratios, fund family size, the diversification level of the fund family measured by the number of investment objectives in the family, and family front loads.[19]

To sum up, the existence of a cheap fund in a mutual fund family decreases family-level flow-performance sensitivity, even after controlling for the effect of average expense ratios in the family. It means that having attention-catching cheap funds helps attract performance-insensitive investors. Fund families can decrease their overall flow-performance sensitivity by providing cheap funds to investors.

4 Alternative explanations

As predicted in the hypothesis, fund expenses influence fund flows and fund-performance sensitivity of other funds in the same fund family. However, the patterns found may have other explanations. I consider the following alternative explanations and provide evidence that none of them eliminates the effect of expenses on the fund flow-performance sensitivity and fund flows of other funds in a fund family.

4.1 Spillover effects of marketing on fund flows and flow-performance sensitivity

Previous literature has used total expenses as a measure for marketing costs (Sirri and Tufano (1998) and Huang et al. (2007)). Funds that have higher expenses spend more on marketing, which may potentially reduce the information costs and increase flow-performance

[19] In Appendix D, I estimate Equation 5 with a piecewise linear model by dividing family performance into three groups: the bottom quintile, the middle three quintiles, and the top quintile. Main results still do not change.

sensitivity.[20] Sirri and Tufano (1998) find that expenses increase flow-performance sensitivity in the high-performance funds and Huang et al. (2007) show that expenses decrease the convexity in the flow-performance relationship. In this paper, I show that the expenses increase flow-performance sensitivity of other funds in the same fund family. The pattern may be driven by the spillover of marketing within the same fund family: if some funds in the family are advertised intensively, and the fund family as a whole becomes more visible, flows of other funds increase and become more sensitive to fund performance.

However, it is not empirically clear whether the spillover effect of marketing in the fund family exists. Even though Kaniel and Parham (2017) document a sizable spillover effect in the fund family if a member fund is among the Wall Street Journal "Category Kings", Gallaher et al. (2015) do not find evidence for a spillover effect of advertisements on fund flows in a family using the print advertising images to identify whether a mutual fund or a fund family advertises. Even if there is a spillover effect of marketing on fund flows, Gallaher et al. (2015) do not find that funds with advertisements have higher expense ratios. It means that fund expense ratios are not necessarily related to advertisements. In this case, the spillover effect of marketing still does not influence the results in this paper.

In order to make sure that the results are not driven by the spillover effect of marketing on fund flows, I use 12b-1 fees plus one-seventh of front loads as a measure for marketing expenses, following Huang et al. (2007). 12b-1 fees are included in the expense ratio as the distribution costs (Ferris and Chance (1987)) and loads are usually used to compensate distributions, e.g., sales by brokers (Reid and Rea (2003)). I control for the marketing expenses of the fund, the value-weighted average marketing expenses of other funds in a fund family, and their interactions with past performance in the baseline model in Equation 4. In this way, the model captures the marginal effect of expenses of other funds in the family on flow-performance sensitivity and fund flows, conditional on a given level of marketing

[20] Apart from the search cost channel, Mullainathan et al. (2008) build up a model of advertising to coarse-thinking mutual fund investors and find empirical evidence that fund advertising works through persuasion. Besides, Jain and J. S. Wu (2000) find no performance-related signal in advertising to support the signal hypothesis.

spending of the fund and the fund family. I run both fixed effect panel regressions as in Table 2 and piecewise linear regressions as in Table 3. Results on the average expense rank of other funds in a family in linear models (Appendix F) are basically the same as in Table 2. Since previous literature finds that the marketing effect is different for funds with different performance (Huang et al. (2007) and Gallaher et al. (2006)), the results in models allowing for non-linear flow-performance relationship, as shown in Table 7, are more informative.

The marketing expenses of the fund increase flow-performance sensitivity, especially in the top performance quintiles, which is consistent with empirical findings in Sirri and Tufano (1998) and Gallaher et al. (2015). After taking out the effect of marketing on flow-performance sensitivity, the marketing expenses have a negative effect on fund flows (Huang et al. (2007)). The marketing of other funds in the fund family has basically no effect on flow-performance sensitivity and fund flows so there is little evidence for the existence of a spillover effect of marketing on fund flows. The marketing expenses of other funds in a fund family increase flow-performance sensitivity if funds perform badly but the results are only marginally significant when the constructed expense rank is used and become insignificant after controlling for the fund fixed effects. The effect of the average expense rank of other funds in the same family on flows and flow-performance sensitivity is at a similar level compared to the results in Table 3. Besides, the negative effect of the expense rank of other funds on fund flows still remains the same and is statistically significant at the 1% level in all models.

In summary, the marketing spillover effect cannot take away the influence of expenses of other funds in the same family on fund flows. It is likely that the expense itself is perceived as the price of a fund and changes flow-performance sensitivity of investors.

4.2 Cross-fund learning about fund performance within a fund family

D. P. Brown and Y. Wu (2016) show that fund flows are positively influenced by the performance of other funds in the same family because there is cross-fund learning about

investment abilities. I find that the expense rank of other funds in the family decreases the fund flows and the existence of a cheap fund in the family increases the fund flows. The effect of expenses of other funds on fund flows may be due to the influence of the performance of other funds in the family since the expenses are a direct deduction from returns. Therefore, it is possible that higher expense ranks in other funds are proxies for worse performance of other funds in the same fund family and it is the worse performance of other funds, as a signal for fund performance, that leads to lower fund flows.

Strictly speaking, the expense measures used in this paper are the expense ranks, so a high expense rank does not necessarily mean a high expense and a low return. But the expense rank and the expense level are highly correlated by definition. Therefore, to assess the importance of cross-fund learning about the performance in driving the results in this paper, I run the tests accounting for the performance of other funds in the same family. Following D. P. Brown and Y. Wu (2016), I define the family performance as the value-weighted average of fund performance of other funds in the same family. Fund performance is measured by adjusted returns in the previous 12 months as discussed in Section 2.2.

As shown in Table 8, the performance of other funds in the family indeed has a positive effect on the fund flows, which is consistent with the findings in D. P. Brown and Y. Wu (2016). The effect is statistically significant at the 1% level in all models. The coefficient estimates of the average expense rank of other funds in the family still remain at a similar level, compared to Table 2. Therefore, the effect of expenses of other funds in the same family on fund flows cannot be explained by the cross-fund learning about the performance.

4.3 Spillover effects of the star phenomenon on fund flows

Nanda et al. (2004) document that a star fund in the family increases flows of other member funds. They further find that large families are more likely to have star funds. In this paper, I find that the existence of a cheap fund in the family increases flows of other funds as well. In addition, large fund families are more likely to have cheap funds due to economies of scale

(Warner and J. S. Wu (2011) and Khorana and Servaes (1999)). Therefore, it is possible that large fund families have cheap funds and star funds at the same time and star funds, instead of cheap funds, attract extra flows to all funds in the family. Besides, the existence of a cheap fund in the fund family indicates that fund expenses of some other funds are low, which increases the possibility to generate a star fund because the stellar phenomenon in Nanda et al. (2004) considers after-fee returns.

Following Nanda et al. (2004), I define a star (dog) fund as the top (bottom) 5% of the adjusted returns over the previous 12 months. A star (dog) in a family is a dummy variable that is equal to one if the family has a star (dog) fund but the fund under consideration is not a star (dog) fund. I include the dummy variables indicating star or dog performance in the baseline models as in Table 4 and present the results in Table 9. Being a performance star attracts extra flows to the family while being a performance dog decreases fund flows. Nanda et al. (2004) find that the existence of stellar performance in the family has a positive spillover effect on the fund flows but the existence of a dog fund does not have a robust spillover effect. The results on the star and dog fund in the family in the models of this paper are the opposite: the coefficients of *Star in family* are positive but statistically insignificant while the coefficients of *Dog in family* are negative and statistically significant at the 1% level. The results are similar to the findings in D. P. Brown and Y. Wu (2016), where the authors use models more similar to those used in this paper, which include interaction terms between fund characteristics and past fund performance to capture flow-performance sensitivity.

The coefficients on *Cheap fund in family*, *Cheap fund*, and their interaction terms with past performance are approximately the same as in Table 4. This suggests that the spillover effect of stellar phenomenon in a fund family does not explain the influence of cheap funds in the family on fund flows. Investors not only regard the expenses as reductions in fund returns but also care about the price of the funds when making mutual fund investment decisions.

5 Conclusion

This paper provides the first evidence that expenses positively influence flow-performance sensitivity and negatively influence the level of flows of other funds in the same fund family. In addition, the existence of a cheap fund in a fund family increases flows and reduces flow-performance sensitivity of other funds in the family. Having a cheap fund under management also reduces the flow-performance sensitivity at the family level.

The results on the spillover effect of fund expenses on fund flows are economically significant and robust. I conjecture that cheap funds attract performance-insensitive investors because these investors do not pay much for asset management and are more inattentive to fund performance than investors who pay higher fees. These investors may choose to invest in other funds in the same fund family after being attracted by the cheap funds, which generates a spillover effect of fund expenses on fund flows. Investors may also perceive other funds in a family with cheap funds to be a bargain without further examining comparable funds in other fund families.

This paper contributes to the understanding of investment behavior of mutual fund investors from the perspective of fund price. Investors care about fund expenses and fund expenses influence not only the fund itself but also other funds in the same family. Fund expenses do not decrease fund returns of other funds in the same family, but they still influence flows of these funds. The results indicate that investors perceive fund expenses as prices of mutual funds. If price-sensitive and performance-insensitive investors are attracted by low prices offered by some funds in a fund family, flow-performance sensitivity of other funds in the fund family also decreases.

The results are important for mutual fund families that set fund expenses. Fund prices are not simply reductions in fund returns. Instead, they have a large impact on investment decisions and therefore, require careful examination. Fund families can attract performance-insensitive investors by offering some cheap funds while keeping the average expense ratios of

all funds in the family constant. Decreasing flow-performance sensitivity and maintaining stable flows are crucial for mutual funds, because liquidity shocks and volatile flows are harmful to fund performance (Edelen (1999), Nanda et al. (2000), Alexander et al. (2006), and Rakowski (2010)).

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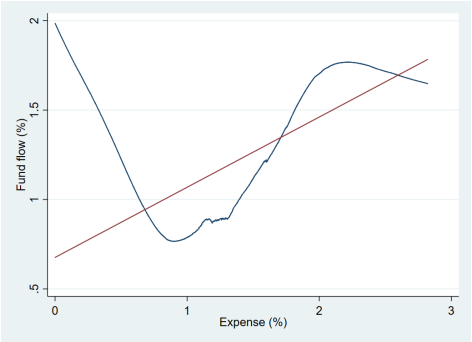
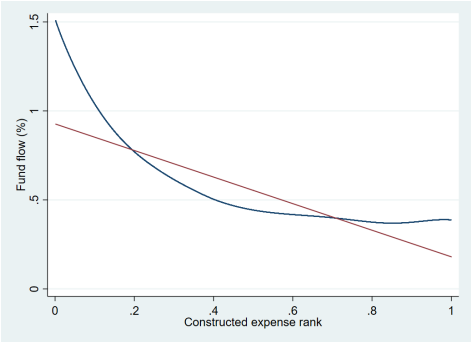
Figure 1: Fund flows at different levels of fund expenses or expense ranks

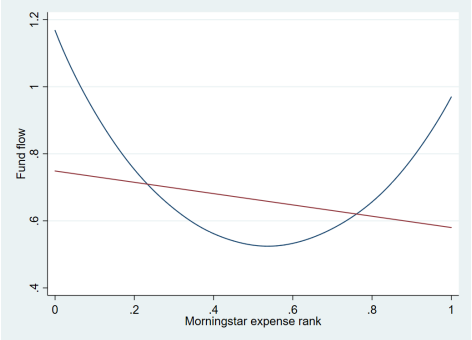
This figure plots fund flows against expense ratios (Panel A), expense ranks constructed in the same share class and CRSP investment objective (Panel B) and Morningstar expense rank (Panel C). The blue line is a locally weighted scatterplot and the red line is a linear prediction plot.



Panel A



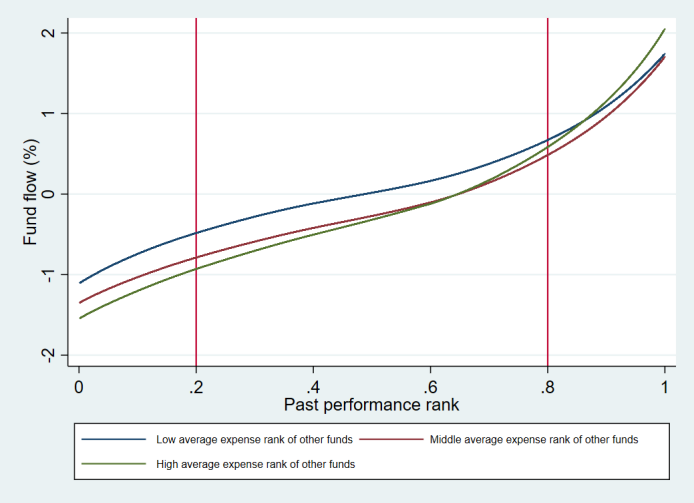
Panel B



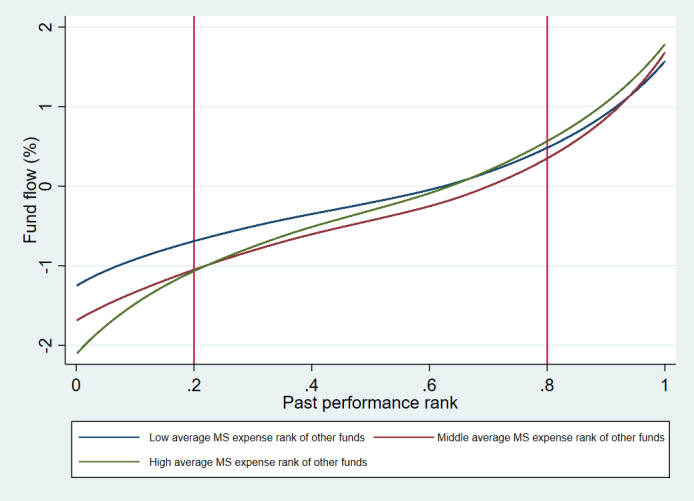
Panel C

Figure 2: Reaction of fund flows to past performance and expense of other funds in the fund family

This figure plots the fund flows against past fund performance when the average expense rank is at the bottom tertile (blue line), middle tertile (red line), or top tertile (green line). Average expense ranks are constructed in the same share class and CRSP investment objective in Panel A and are Morningstar expense rank in Panel B. The red vertical lines indicate the non-linearity in the relationship between fund flows and past performance according to Sirri and Tufano (1998).



Panel A



Panel B

Table 1: Summary statistics

This table contains summary statistics, including the number of observations (Obs), mean, standard deviation (Std. Dev.), 25% percentile (P25) and 75% percentile (P75), for mutual funds and mutual fund families in the whole sample. The sample excludes fund families with total net assets below 10 million US dollars and fewer than 5 funds. Each fund represents one share class. Panel A contains variables at the fund level. Fund flow is the money flow to a fund scaled by the fund TNA in the previous month; Expense ratio is the expense ratio of a fund as of the most recent fiscal year end; Previous returns are calculated with accumulated fund monthly net returns over the previous 12 months; Previous objective-adjusted returns are fund monthly net returns adjusted by the average returns in the same share class and investment objective; TNA is the fund total net assets; and turnover ratio is the year-end turnover ratio of a fund. Panel B contains variables at the fund family level. Family flow is the money flow to a fund family scaled by the family TNA in the previous month; Family TNA is the sum of total net assets of funds in the family; Family expense ratio, Family objective adjusted returns, and Family turnover are all value-weighted measures of the funds in the fund family; Number of funds in the family counts the number of funds in the family. Further variable definitions can be found in Appendix A.

Variable	Obs	Mean	Std. Dev.	P25	P75
Panel A: Fund level					
Fund flow (%)	2,846,039	0.812	9.472	-1.798	1.621
Expense ratio (%)	2,902,458	1.218	0.616	0.760	1.65
Previous returns (%)	2,778,839	6.717	15.012	0.185	13.872
Previous objective-adjusted returns (%)	2,520,576	0.100	6.747	-2.185	2.166
Flow volatility (%)	2,520,576	2.862	2.172	1.063	4.266
TNA (million dollar)	2,854,639	459.039	1186.226	21.9	303.7
Turnover (%)	2,554,061	87.177	112.941	24.41	103
Panel B: Fund family level					
Family flow (%)	61,086	0.274	7.263	-1.125	1.241
Family expense ratio (%)	64,575	1.06	0.432	0.757	1.314
Family objective adjusted returns	62,288	0.004	0.050	-0.011	0.016
Family TNA (million dollar)	64,575	23209.89	75448.64	921.1	15160.7
Family turnover	62,492	77.719	76.658	34.734	95.139
Number of funds in family	64,863	47.761	78.735	7	49

Table 2: Effect of expense rank of other funds in the family on fund flows and flow-performance sensitivity- Linear model

This table contains results of fixed-effect panel regressions. The dependent variable is Fund flows. The main independent variable is Average expense rank of other funds in family and its interaction term with past fund performance. Columns (1) to (3) define expense ranks by comparing fund expenses within funds with the same share class and CRSP investment objective. Columns (4) to (6) follow the Morningstar methodology to define expense ranks. Fund performance is measured by the rank of monthly investment objective adjusted returns over the previous 12 months. Control variables include expense rank, family size, attrition, fund age, fund size, fund return volatility, turnover ratio, past fund performance rank, and interaction terms between expense rank, family size, attrition as well as fund age and past fund performance. Definitions of all variables can be found in Appendix A. Independent variables are all lagged by one month. t-statistics are provided in parentheses. Standard errors are clustered by fund and time. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Expense rank:	Dependent variable: Fund flows					
	Constructed			Morningstar		
	(1)	(2)	(3)	(4)	(5)	(6)
Average expense rank of other funds in family × Fund performance	1.692***	1.738***	1.796***	1.532***	1.594***	1.684***
	(6.40)	(6.86)	(7.26)	(6.46)	(6.88)	(7.64)
Expense rank × Fund performance	0.257**	0.406***	0.453***	0.421***	0.371***	0.413***
	(2.01)	(3.21)	(3.62)	(3.50)	(3.12)	(3.53)
Expense rank	-0.411***	-0.541***	-0.487***	-0.401***	-0.280***	-0.244***
	(-5.63)	(-7.62)	(-5.21)	(-5.89)	(-4.15)	(-2.79)
Average expense rank of other funds in family	-1.010***	-0.605***	-0.411*	-1.011***	-0.522***	-0.569***
	(-6.56)	(-4.11)	(-1.73)	(-7.93)	(-4.18)	(-3.51)
Fund performance	3.545***	3.465***	2.084***	4.109***	4.201***	2.783***
	(9.10)	(8.99)	(5.04)	(10.37)	(10.63)	(6.64)
Family size × Fund performance	0.053**	0.055**	0.070***	0.018	0.015	0.040
	(2.09)	(2.26)	(2.74)	(0.72)	(0.61)	(1.58)
Attrition × Fund performance	-0.743***	-0.747***	-0.772***	-0.830***	-0.804***	-0.801***
	(-5.05)	(-5.21)	(-5.61)	(-5.64)	(-5.63)	(-5.97)
Log fund age × Fund performance	-1.091***	-1.080***	-0.698***	-1.098***	-1.098***	-0.750***
	(-15.59)	(-15.64)	(-9.64)	(-15.29)	(-15.40)	(-10.06)
Fund flow volatility	0.013	-0.053*	-0.096***	0.038	-0.053*	-0.095***
	(0.55)	(-1.71)	(-2.98)	(1.59)	(-1.76)	(-2.93)
Log fund TNA	-0.084***	-0.187***	-1.427***	-0.081***	-0.173***	-1.373***
	(-8.98)	(-19.96)	(-37.45)	(-8.46)	(-17.97)	(-35.95)
Log family TNA	-0.014	0.053***	0.054**	-0.006	0.072***	0.056**
	(-1.01)	(3.91)	(2.24)	(-0.42)	(5.32)	(2.23)
Turnover	0.001***	0.001***	0.001***	0.002***	0.001***	0.001***
	(6.62)	(5.84)	(2.84)	(7.72)	(5.52)	(2.93)
Log fund age	0.036	0.059	-1.072***	0.110***	0.092**	-1.083***
	(0.85)	(1.42)	(-13.19)	(2.62)	(2.21)	(-13.28)
Attrition	-3.051***	-2.859***	-5.571***	-3.197***	-2.933***	-5.753***
	(-34.03)	(-32.71)	(-35.28)	(-36.41)	(-33.18)	(-37.60)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Investment category fixed effects	No	Yes	No	No	Yes	No
Fund fixed effects	No	No	Yes	No	No	Yes
Observations	2,247,071	2,247,070	2,246,814	1,961,260	1,961,259	1,961,092
Adjusted R^2	0.060	0.069	0.114	0.070	0.079	0.125

Table 3: Effect of expense rank of other funds in family on fund flows and flow-performance sensitivity - Non-linear model

This table contains results of piecewise linear regressions. The dependent variable is Fund flows. The main independent variable is Average expense rank of other funds in family and its interaction term with the fund performance. Columns (1) to (3) define expense ranks by comparing fund expenses within funds with the same share class and CRSP investment objective. Columns (4) to (6) follow the Morningstar methodology to define expense ranks. Fund performance is measured by the rank of monthly investment objective adjusted returns over the previous 12 months. The fractional rank for obervations in the bottom performance quintile (Bottom performance) is defined as Min(Rank$_{t-1}$, 0.2). Observations in the three medium performance quintiles (Middle performance) are defined as Min(0.6, Rank$_{t-1}$). The rank for the top performance quintile (Top performance) is defined as (Rank$_{t-1}$−Bottom performance−Middle performance). Control variables include expense rank, family size, attrition, fund age, fund size, fund return volatility, turnover ratio, past fund performance rank, and interaction terms between expense rank, family size, attrition as well as fund age and past fund performance rank. Definitions of all variables can be found in Appendix A. Control variables are omitted for the sake of brevity. Independent variables are all lagged by one month. t-statistics are provided in parentheses. Standard errors are clustered by fund and time. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Expense rank:	Dependent variable: Fund flows					
	Constructed			Morningstar		
	(1)	(2)	(3)	(4)	(5)	(6)
Average expense rank of other funds in family × Bottom performance	4.606***	4.449***	5.008***	5.324***	5.345***	4.649***
	(3.10)	(3.05)	(3.47)	(4.10)	(4.20)	(3.80)
Average expense rank of other funds in family × Middle performance	0.555	0.660**	0.952***	0.594**	0.687**	1.097***
	(1.60)	(1.99)	(3.19)	(2.01)	(2.39)	(4.16)
Average expense rank of other funds in family × Top performance	7.895***	7.691***	5.504***	4.098***	3.943***	2.696**
	(5.08)	(5.04)	(3.91)	(2.84)	(2.81)	(2.00)
Expense rank × Bottom performance	-0.891	-0.496	-0.887	-0.188	-0.402	-1.179*
	(-1.18)	(-0.68)	(-1.24)	(-0.25)	(-0.54)	(-1.66)
Expense rank × Middle performance	0.023	-0.069	0.061	0.127	0.055	0.123
	(0.14)	(-0.44)	(0.42)	(0.86)	(0.37)	(0.90)
Expense rank × Top performance	0.676	2.335***	2.492***	2.751***	2.948***	3.498***
	(0.91)	(3.18)	(3.47)	(3.28)	(3.58)	(4.70)
Average expense rank of other funds in family	-1.322***	-0.901***	-0.825***	-1.483***	-0.994***	-0.955***
	(-4.95)	(-3.52)	(-2.78)	(-6.25)	(-4.28)	(-3.87)
Expense rank	-0.201	-0.327**	-0.212	-0.276*	-0.129	0.046
	(-1.43)	(-2.45)	(-1.45)	(-1.93)	(-0.93)	(0.32)
Bottom performance	4.280**	3.838**	2.406	4.127**	4.244**	4.785***
	(2.23)	(2.05)	(1.29)	(2.13)	(2.20)	(2.63)
Middle performance	2.447***	2.465***	1.413***	2.286***	2.339***	1.351***
	(5.44)	(5.57)	(3.20)	(5.39)	(5.54)	(3.24)
High performance	10.238***	9.815***	6.297***	15.670***	16.127***	10.262***
	(5.19)	(5.12)	(3.52)	(7.69)	(8.17)	(5.47)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Investment category fixed effects	No	Yes	No	No	Yes	No
Fund fixed effects	No	No	Yes	No	No	Yes
Observations	2,247,071	2,247,070	2,246,814	1,961,260	1,961,259	1,961,092
Adjusted R^2	0.061	0.070	0.115	0.071	0.080	0.126

Table 4: Effect of cheap funds in family on flows and flow-performance sensitivity of other funds - Linear model

This table contains results of fixed-effect panel regressions. The dependent variable is Fund flows. The main independent variable is Cheap fund in family and its interaction terms with the Fund performance. Columns (1) to (3) define expense ranks by comparing fund expenses within funds with the same share class and CRSP investment objective. Columns (4) to (6) follow the Morningstar methodology to define expense ranks. Cheap funds are defined as the bottom quintile of the expense ranks. Cheap fund in family is equal to one if a fund is not defined as cheap but belongs to a fund family with a cheap fund. Fund performance is measured by the rank of monthly investment objective adjusted returns over the previous 12 months. Control variables include expense rank, family size, attrition, fund age, fund size, fund return volatility, turnover ratio, past fund performance rank, and interaction terms between expense rank, family size, attrition as well as fund age and past fund performance rank. Definitions of all variables can be found in Appendix A. Independent variables are all lagged by one month. t-statistics are provided in parentheses. Standard errors are clustered by fund and time. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Expense rank:	Dependent variable: Fund flows					
	Constructed			Morningstar		
	(1)	(2)	(3)	(4)	(5)	(6)
Cheap fund in family × Fund performance	-0.810***	-0.774***	-0.731***	-0.695***	-0.699***	-0.722***
	(-5.40)	(-5.27)	(-5.08)	(-4.62)	(-4.69)	(-5.21)
Cheap fund × Fund performance	-0.838***	-0.794***	-0.750***	-0.679***	-0.638***	-0.681***
	(-5.06)	(-4.91)	(-4.66)	(-4.09)	(-3.89)	(-4.42)
Cheap fund in family	-0.035	0.158*	0.226**	0.144*	0.282***	0.337***
	(-0.39)	(1.80)	(2.14)	(1.88)	(3.74)	(4.12)
Cheap fund	-0.099	0.326***	0.359***	0.179**	0.377***	0.455***
	(-1.00)	(3.33)	(3.06)	(2.05)	(4.32)	(4.95)
Fund performance	2.648***	2.583***	1.330***	2.718***	2.754***	1.657***
	(8.09)	(8.02)	(4.16)	(7.64)	(7.81)	(4.83)
Family size × Fund performance	0.092***	0.099***	0.095***	0.067***	0.070***	0.075***
	(4.16)	(4.67)	(4.50)	(2.95)	(3.20)	(3.43)
Attrition × Fund performance	-1.238***	-1.154***	-1.212***	-1.338***	-1.244***	-1.245***
	(-7.71)	(-7.32)	(-8.03)	(-8.39)	(-7.97)	(-8.50)
Log fund age × Fund performance	-0.880***	-0.896***	-0.481***	-0.865***	-0.888***	-0.528***
	(-13.06)	(-13.35)	(-7.02)	(-12.57)	(-12.89)	(-7.56)
Fund expense ratio × Fund performance	0.954***	0.910***	1.007***	0.971***	0.924***	0.949***
	(10.88)	(10.45)	(11.60)	(10.55)	(10.11)	(10.61)
Family expense ratio × Fund performance	0.515***	0.576***	0.440***	0.586***	0.633***	0.521***
	(3.89)	(4.42)	(3.23)	(4.35)	(4.75)	(3.79)
Expense ratio	-1.196***	-0.682***	-0.170	-1.092***	-0.598***	-0.046
	(-22.48)	(-11.26)	(-1.44)	(-20.68)	(-10.19)	(-0.39)
Family expense	-0.074	0.085	0.129	-0.059	0.041	0.045
	(-0.97)	(1.14)	(1.19)	(-0.77)	(0.55)	(0.42)
Fund flow volatility	0.076***	-0.055*	-0.098***	0.093***	-0.053*	-0.098***
	(3.10)	(-1.79)	(-3.07)	(3.89)	(-1.73)	(-3.05)
Log fund TNA	-0.151***	-0.197***	-1.407***	-0.140***	-0.183***	-1.359***
	(-15.14)	(-20.60)	(-37.04)	(-13.82)	(-18.74)	(-35.85)
Log family TNA	0.030**	0.068***	0.069***	0.014	0.065***	0.064***
	(2.27)	(5.45)	(2.94)	(1.18)	(5.29)	(2.66)
Turnover	0.002***	0.001***	0.001***	0.002***	0.001***	0.001***
	(7.72)	(5.97)	(2.61)	(8.78)	(5.91)	(2.71)
Log fund age	-0.072*	-0.031	-1.200***	-0.020	-0.014	-1.200***
	(-1.68)	(-0.75)	(-14.75)	(-0.47)	(-0.33)	(-14.83)
Attrition	-2.640***	-2.618***	-5.265***	-2.786***	-2.674***	-5.456***
	(-28.22)	(-29.52)	(-33.37)	(-31.30)	(-30.34)	(-35.97)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Investment category fixed effects	No	Yes	No	No	Yes	No
Fund fixed effects	No	No	Yes	No	No	Yes
Observations	2,247,096	2,247,095	2,246,839	1,961,276	1,961,275	1,961,108
Adjusted R^2	0.063	0.070	0.115	0.073	0.080	0.126

Table 5: Effect of cheap funds in family on flows and flow-performance sensitivity of other funds - Non-linear model

This table contains results of piecewise linear regressions. The dependent variable is Fund flows. The main independent variable is Cheap fund in family and its interaction terms with the Fund performance. Columns (1) to (3) define expense ranks by comparing fund expenses within funds with the same share class and CRSP investment objective. Columns (4) to (6) follow the Morningstar methodology to define expense ranks. Cheap funds are defined as the bottom quintile of the expense ranks. Cheap fund in family is equal to one if the fund is not defined as cheap but belongs to a fund family with a cheap fund. Fund performance is measured by the rank of monthly investment objective adjusted returns over the previous 12 months. The fractional rank for observations in the bottom performance quintile (Bottom performance) is defined as Min(Rank$_{t-1}$, 0.2). Observations in the three medium performance quintiles (Middle performance) are defined as Min(0.6, Rank$_{t-1}$). The rank for the top performance quintile (Top performance) is defined as (Rank$_{t-1}$−Bottom performance−Middle performance). Control variables include expense rank, family size, attrition, fund age, fund size, fund return volatility, turnover ratio, past fund performance rank, and interaction terms between expense rank, family size, attrition as well as fund age and past fund performance rank. Definitions of all variables can be found in Appendix A. Control variables are omitted for the sake of brevity. Independent variables are all lagged by one month. t-statistics are provided in parentheses. Standard errors are clustered by fund and time. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Expense rank:	Dependent variable: Fund flows					
	Constructed			Morningstar		
	(1)	(2)	(3)	(4)	(5)	(6)
Cheap fund in family × Bottom performance	-0.895	-0.427	-0.359	-1.651**	-1.326*	-0.942
	(-1.14)	(-0.55)	(-0.49)	(-2.21)	(-1.80)	(-1.35)
Cheap fund in family × Middle performance	-0.268	-0.247	-0.345**	-0.504***	-0.482***	-0.491***
	(-1.41)	(-1.31)	(-2.03)	(-2.92)	(-2.80)	(-3.11)
Cheap fund in family × Top performance	-3.575***	-3.761***	-2.858***	-0.762	-1.162	-1.595*
	(-3.82)	(-4.11)	(-3.24)	(-0.82)	(-1.27)	(-1.85)
Cheap fund× Bottom performance	-2.168**	-1.899**	-1.475*	-2.933***	-2.464***	-1.177
	(-2.39)	(-2.13)	(-1.78)	(-3.27)	(-2.77)	(-1.41)
Cheap fund× Middle performance	0.086	0.087	-0.113	-0.322*	-0.242	-0.304*
	(0.42)	(0.43)	(-0.60)	(-1.73)	(-1.30)	(-1.79)
Cheap fund× Top performance	-5.436***	-5.151***	-3.801***	-1.263	-1.814*	-2.581***
	(-5.35)	(-5.25)	(-4.01)	(-1.23)	(-1.79)	(-2.72)
Cheap fund in family	-0.100	0.021	0.098	0.264*	0.344***	0.326**
	(-0.71)	(0.15)	(0.67)	(1.96)	(2.62)	(2.53)
Cheap fund	-0.010	0.359**	0.372**	0.496***	0.606***	0.472***
	(-0.06)	(2.23)	(2.24)	(3.00)	(3.72)	(3.05)
Bottom performance	5.833***	6.057***	4.145**	6.456***	6.770***	5.767***
	(3.55)	(3.70)	(2.48)	(3.56)	(3.69)	(3.24)
Middle performance	1.424***	1.296***	0.499	1.272***	1.254***	0.575
	(3.61)	(3.36)	(1.40)	(3.08)	(3.05)	(1.48)
High performance	8.679***	8.772***	4.769***	9.738***	10.095***	6.030***
	(4.53)	(4.73)	(2.78)	(4.56)	(4.91)	(3.06)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Investment category fixed effects	No	Yes	No	No	Yes	No
Fund fixed effects	No	No	Yes	No	No	Yes
Observations	2,247,096	2,247,095	2,246,839	1,961,276	1,961,275	1,961,108
Adjusted R^2	0.064	0.071	0.116	0.074	0.081	0.127

Table 6: Effect of cheap funds in family on flows and flow-performance sensitivity at the family level

This table contains results of fixed-effect panel regressions. The dependent variable is Family flow. The main independent variable is Cheap family dummy and its interaction term with the Family past performance. Cheap family is a dummy variable equal to one if a family holds a cheap member fund, i.e., a fund with the expense rank in the bottom quintile. Columns (1) to (3) define expense ranks by comparing fund expenses within funds with the same share class and CRSP investment objective. Columns (4) to (6) follow the Morningstar methodology to define expense ranks. Family past performance is measured by the value-weighted average of the performance rank of the funds in the fund family. Control variables include family size, family past performance rank, family turnover, Return dispersion in family, Number of investment objectives, Family front load, and the interaction terms between expense rank and family size. Definitions of all variables can be found in Appendix A. Independent variables are all lagged by one month. t-statistics are provided in parentheses. Standard errors are clustered by fund and time. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Expense rank:	Dependent variable: Fund flows			
	Constructed		Morningstar	
	(1)	(2)	(3)	(4)
Cheap fund in family × Past family performance rank	-0.712**	-0.650**	-0.805**	-0.985***
	(-2.33)	(-2.20)	(-2.46)	(-2.99)
Cheap fund in family	0.047	0.025	0.216	0.322*
	(0.28)	(0.14)	(1.23)	(1.66)
Log family TNA × Past family performance rank	-0.076	-0.076	-0.065	-0.046
	(-0.91)	(-0.86)	(-0.82)	(-0.57)
Family expense ratio × Fund performance	2.038***	1.975***	2.108***	1.969***
	(6.01)	(5.09)	(5.99)	(4.98)
Family past performance rank	0.713	0.560	0.637	0.603
	(0.82)	(0.59)	(0.71)	(0.62)
Family expense ratio	-1.206***	-0.315	-1.158***	-0.259
	(-6.71)	(-0.74)	(-6.21)	(-0.60)
Log family TNA	0.066	-0.288**	0.058	-0.306**
	(1.32)	(-2.18)	(1.20)	(-2.20)
Family turnover	-0.000	0.001	-0.000	0.001
	(-0.35)	(0.55)	(-0.54)	(0.48)
Return SD in family	0.104**	0.074	0.104**	0.079
	(1.97)	(1.24)	(2.01)	(1.31)
Log number of investment objectives in family	-0.348***	-0.226	-0.394***	-0.265
	(-3.06)	(-1.02)	(-3.49)	(-1.10)
Family front load	-0.050	-0.170*	-0.055	-0.169*
	(-1.39)	(-1.86)	(-1.48)	(-1.82)
Time fixed effects	Yes	Yes	Yes	Yes
Fund family fixed effects	No	Yes	No	Yes
Observations	42,826	42,821	42,133	42,129
Adjusted R^2	0.059	0.097	0.061	0.101

Table 7: Effect of expense rank of other funds in family on fund flows and flow-performance sensitivity after controlling for marketing expenses

This table contains results of pieseweise linear regressions after controlling for the marketing expenses of the fund and the family. The marketing expenses are defined as the 12b-1 fees plus one-seventh of the front loads. The family marketing expenses take the value-weighted average of the marketing expenses of funds in the fund family. The dependent variable is Fund flows. The main independent variable is Average expense rank of other funds in family and its interaction term with the Performance quintiles (Bottom performance, Middle performance, and Top performance). Columns (1) to (3) define expense ranks by comparing fund expenses within funds with the same share class and CRSP investment objective. Columns (4) to (6) follow the Morningstar methodology to define expense ranks. Other control variables are the same as in Table 3 and are all defined in detail in Appendix A. Independent variables are all lagged by one month. t-statistics are provided in parentheses. Standard errors are clustered by fund and time. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Expense rank:	Dependent variable: Fund flows					
	Constructed			Morningstar		
	(1)	(2)	(3)	(4)	(5)	(6)
Average expense rank of other funds in family × Bottom performance	3.485**	3.399**	4.313***	3.892***	3.959***	4.227***
	(2.35)	(2.32)	(2.92)	(2.96)	(3.04)	(3.32)
Average expense rank of other funds in family × Middle performance	0.454	0.509	0.839***	0.591*	0.656**	1.107***
	(1.28)	(1.49)	(2.71)	(1.93)	(2.18)	(3.98)
Average expense rank of other funds in family × Top performance	6.366***	6.336***	4.127***	3.242**	3.288**	1.633
	(4.01)	(4.06)	(2.87)	(2.10)	(2.19)	(1.12)
Expense rank × Bottom performance	-1.290*	-0.728	-1.093	-0.634	-0.721	-1.436**
	(-1.70)	(-0.98)	(-1.52)	(-0.84)	(-0.96)	(-1.99)
Expense rank × Middle performance	0.066	-0.108	0.006	0.114	0.011	0.066
	(0.42)	(-0.70)	(0.04)	(0.76)	(0.07)	(0.47)
Expense rank × Top performance	-0.133	1.640**	1.837**	2.067**	2.163***	2.690***
	(-0.18)	(2.25)	(2.58)	(2.45)	(2.61)	(3.61)
Average expense rank of other funds in family	-0.817***	-0.692***	-0.635**	-0.989***	-0.828***	-0.875***
	(-3.08)	(-2.68)	(-2.08)	(-4.10)	(-3.47)	(-3.41)
Expense rank	-0.034	-0.270**	-0.153	-0.050	-0.028	0.124
	(-0.24)	(-1.98)	(-1.04)	(-0.35)	(-0.20)	(0.85)
Bottom performance	4.649**	4.259**	2.868	4.501**	4.667**	5.074***
	(2.45)	(2.27)	(1.54)	(2.35)	(2.42)	(2.78)
Middle performance	2.456***	2.496***	1.452***	2.259***	2.316***	1.340***
	(5.45)	(5.62)	(3.28)	(5.35)	(5.48)	(3.19)
High performance	11.746***	11.256***	7.776***	16.237***	16.755***	11.105***
	(5.94)	(5.88)	(4.31)	(7.98)	(8.50)	(5.89)
Marketing expenses × Bottom performance	0.728	0.772	0.949*	1.154*	1.245**	1.020*
	(1.29)	(1.41)	(1.87)	(1.83)	(2.02)	(1.79)
Marketing expenses × Middle performance	0.217*	0.246*	0.290**	0.205	0.228*	0.273**
	(1.69)	(1.96)	(2.33)	(1.49)	(1.69)	(2.07)
Marketing expenses × Top performance	4.637***	4.082***	4.486***	3.714***	3.463***	3.906***
	(7.34)	(6.74)	(7.51)	(5.55)	(5.41)	(6.29)
Family marketing expenses × Bottom performance	2.044**	1.679**	0.539	1.571*	1.231	-0.093
	(2.56)	(2.13)	(0.70)	(1.86)	(1.47)	(-0.11)
Family marketing expenses × Middle performance	0.110	0.111	0.017	-0.034	-0.062	-0.143
	(0.60)	(0.62)	(0.10)	(-0.18)	(-0.33)	(-0.80)
Family marketing expenses × Top performance	-1.613*	-1.611*	-1.993**	-1.293	-1.305	-1.203
	(-1.87)	(-1.93)	(-2.50)	(-1.34)	(-1.40)	(-1.35)
Marketing expenses	-1.119***	-0.373***	-0.095	-1.170***	-0.494***	-0.157
	(-10.82)	(-3.48)	(-0.87)	(-10.23)	(-4.23)	(-1.32)
Family marketing expenses	-0.248	-0.049	-0.010	-0.119	0.029	0.114
	(-1.65)	(-0.33)	(-0.06)	(-0.75)	(0.19)	(0.66)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Investment category fixed effects	No	Yes	No	No	Yes	No
Fund fixed effects	No	No	Yes	No	No	Yes
Observations	2,246,749	2,246,748	2,246,492	1,961,066	1,961,065	1,960,898
Adjusted R^2	0.063	0.071	0.115	0.074	0.081	0.126

Table 8: Effect of expense rank of other funds in family on fund flows and flow-performance sensitivity after controlling for family performance

This table contains results of fixed-effect panel regressions after controlling for the family performance. Family performance is defined as the average fund risk adjusted returns in the family, excluding the fund under consideration. The dependent variable is Fund flows. The main independent variable is Average expense rank of other funds in family and its interaction term with the Fund performance. Columns (1) to (3) define expense ranks by comparing fund expenses within funds with the same share class and CRSP investment objective. Columns (4) to (6) follow the Morningstar methodology to define expense ranks. Other control variables are the same as in Table 2 and are all defined in detail in Appendix A. Independent variables are all lagged by one month. t-statistics are provided in parentheses. Standard errors are clustered by fund and time. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Expense rank:	Dependent variable: Fund flows					
	Constructed			Morningstar		
	(1)	(2)	(3)	(4)	(5)	(6)
Average expense rank of other funds in family × Fund performance	1.664***	1.711***	1.781***	1.470***	1.532***	1.645***
	(6.34)	(6.78)	(7.20)	(6.24)	(6.65)	(7.48)
Expense rank × Fund performance	0.279**	0.425***	0.463***	0.441***	0.391***	0.424***
	(2.20)	(3.37)	(3.70)	(3.68)	(3.30)	(3.63)
Expense rank	-0.423***	-0.554***	-0.502***	-0.410***	-0.288***	-0.256***
	(-5.83)	(-7.83)	(-5.40)	(-6.06)	(-4.30)	(-2.94)
Average expense rank of other funds in family	-1.004***	-0.605***	-0.443*	-1.011***	-0.528***	-0.589***
	(-6.59)	(-4.14)	(-1.85)	(-7.97)	(-4.24)	(-3.62)
Fund performance	3.185***	3.126***	1.879***	3.758***	3.891***	2.607***
	(8.44)	(8.37)	(4.69)	(9.71)	(10.07)	(6.38)
Family past performance	0.052***	0.049***	0.029***	0.050***	0.045***	0.027***
	(8.72)	(8.54)	(5.02)	(8.72)	(8.07)	(4.66)
Family size × Fund performance	0.080***	0.082***	0.086***	0.045*	0.039	0.054**
	(3.27)	(3.40)	(3.46)	(1.83)	(1.62)	(2.18)
Attrition × Fund performance	-0.731***	-0.734***	-0.765***	-0.817***	-0.792***	-0.794***
	(-4.98)	(-5.13)	(-5.56)	(-5.56)	(-5.56)	(-5.93)
Log fund age × Fund performance	-1.091***	-1.081***	-0.699***	-1.097***	-1.097***	-0.750***
	(-15.63)	(-15.69)	(-9.67)	(-15.31)	(-15.42)	(-10.08)
Fund flow volatility	0.012	-0.052*	-0.095***	0.037	-0.053*	-0.094***
	(0.52)	(-1.70)	(-2.96)	(1.56)	(-1.74)	(-2.92)
Log fund TNA	-0.083***	-0.186***	-1.423***	-0.081***	-0.172***	-1.368***
	(-8.97)	(-20.05)	(-37.36)	(-8.43)	(-17.95)	(-35.87)
Log family TNA	-0.035**	0.033**	0.047*	-0.027*	0.052***	0.050**
	(-2.51)	(2.47)	(1.94)	(-1.97)	(3.88)	(1.97)
Turnover	0.001***	0.001***	0.001***	0.002***	0.001***	0.001***
	(6.65)	(5.92)	(2.88)	(7.77)	(5.59)	(2.96)
Log fund age	0.030	0.051	-1.083***	0.104**	0.085**	-1.093***
	(0.70)	(1.25)	(-13.38)	(2.49)	(2.05)	(-13.46)
Attrition	-3.047***	-2.855***	-5.558***	-3.194***	-2.930***	-5.742***
	(-33.95)	(-32.68)	(-35.34)	(-36.39)	(-33.18)	(-37.71)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Investment category fixed effects	No	Yes	No	No	Yes	No
Fund fixed effects	No	No	Yes	No	No	Yes
Observations	2,246,735	2,246,734	2,246,478	1,961,059	1,961,058	1,960,891
Adjusted R^2	0.060	0.070	0.115	0.070	0.079	0.125

Table 9: Effect of expense rank of other funds in family on fund flows and flow-performance sensitivity after controlling for star and dog performance

This table contains results of fixed-effect panel regressions after controlling for the spillover effect of the star phenomenon in the family. The dependent variable is Fund flows. The main independent variable is Average expense rank of other funds in family and its interaction term with the Fund performance. Columns (1) to (3) define expense ranks by comparing fund expenses within funds with the same share class and CRSP investment objective. Columns (4) to (6) follow the Morningstar methodology to define expense ranks. Performance star (dog) is a dummy variable equal to one if fund performance is in the top (bottom) 5% among the funds with the same CRSP investment objective and share class, following Nanda et al. (2004). Star (dog) in family is a dummy variable equal to one if the fund is not a star (dog) fund and there is a star (dog) fund in the same fund family. Other control variables are the same as in Table 2 and are all defined in detail in Appendix A. Independent variables are all lagged by one month. t-statistics are provided in parentheses. Standard errors are clustered by fund and time. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Expense rank:	Dependent variable: Fund flows					
	Constructed			Morningstar		
	(1)	(2)	(3)	(4)	(5)	(6)
Cheap fund in family × Fund performance	-0.794***	-0.751***	-0.719***	-0.659***	-0.660***	-0.694***
	(-5.38)	(-5.20)	(-5.12)	(-4.41)	(-4.48)	(-5.05)
Cheap fund × Fund performance	-0.866***	-0.794***	-0.748***	-0.678***	-0.638***	-0.679***
	(-5.30)	(-5.00)	(-4.77)	(-4.11)	(-3.92)	(-4.46)
Cheap fund in family	-0.032	0.155*	0.216**	0.134*	0.264***	0.316***
	(-0.36)	(1.77)	(2.09)	(1.77)	(3.53)	(3.90)
Cheap fund	-0.081	0.319***	0.349***	0.180**	0.368***	0.444***
	(-0.81)	(3.29)	(3.04)	(2.07)	(4.23)	(4.89)
Fund performance	2.243***	2.164***	1.019***	2.273***	2.312***	1.330***
	(6.84)	(6.72)	(3.22)	(6.35)	(6.55)	(3.89)
Performance star	0.726***	0.815***	0.609***	0.784***	0.879***	0.637***
	(13.61)	(15.18)	(12.52)	(14.15)	(15.84)	(12.46)
Star in family	0.068**	0.065**	0.038	0.058**	0.070***	0.030
	(2.51)	(2.43)	(1.59)	(2.24)	(2.71)	(1.26)
Performance dog	-0.147***	-0.124***	-0.159***	-0.156***	-0.125***	-0.172***
	(-3.38)	(-2.88)	(-3.88)	(-3.42)	(-2.76)	(-4.08)
Dog in family	-0.122***	-0.110***	-0.091***	-0.148***	-0.114***	-0.090***
	(-5.16)	(-4.69)	(-4.16)	(-6.24)	(-4.81)	(-4.12)
Family size × Fund performance	0.100***	0.106***	0.100***	0.077***	0.080***	0.081***
	(4.49)	(4.98)	(4.78)	(3.41)	(3.69)	(3.73)
Attrition × Fund performance	-1.137***	-1.029***	-1.130***	-1.208***	-1.097***	-1.154***
	(-7.23)	(-6.67)	(-7.61)	(-7.81)	(-7.24)	(-8.04)
Log fund age × Fund performance	-0.851***	-0.871***	-0.460***	-0.844***	-0.870***	-0.510***
	(-12.66)	(-12.98)	(-6.70)	(-12.24)	(-12.60)	(-7.29)
Expense ratio × Fund performance	0.930***	0.880***	0.983***	0.936***	0.876***	0.916***
	(10.67)	(10.16)	(11.40)	(10.22)	(9.66)	(10.29)
Family expense ratio × Fund performance	0.488***	0.554***	0.419***	0.565***	0.613***	0.503***
	(3.69)	(4.28)	(3.10)	(4.21)	(4.64)	(3.68)
Expense ratio	-1.172***	-0.682***	-0.133	-1.063***	-0.590***	-0.007
	(-22.23)	(-11.38)	(-1.13)	(-20.27)	(-10.10)	(-0.06)
Family expense	-0.064	0.092	0.146	-0.049	0.045	0.062
	(-0.84)	(1.23)	(1.36)	(-0.63)	(0.61)	(0.59)
Fund flow volatility	0.073***	-0.063**	-0.098***	0.090***	-0.061**	-0.097***
	(2.99)	(-2.04)	(-3.06)	(3.75)	(-2.01)	(-3.03)
Log fund TNA	-0.148***	-0.196***	-1.376***	-0.139***	-0.184***	-1.333***
	(-15.01)	(-20.71)	(-36.73)	(-13.83)	(-18.92)	(-35.52)
Log family TNA	0.030**	0.069***	0.076***	0.019	0.065***	0.073***
	(2.26)	(5.42)	(3.20)	(1.49)	(5.20)	(2.98)
Turnover	0.002***	0.001***	0.001**	0.002***	0.001***	0.001**
	(7.52)	(5.82)	(2.38)	(8.57)	(5.77)	(2.50)
Log fund age	-0.049	-0.008	-1.150***	0.007	0.015	-1.145***
	(-1.13)	(-0.19)	(-14.16)	(0.17)	(0.35)	(-14.19)
Attrition	-2.675***	-2.664***	-5.206***	-2.832***	-2.731***	-5.412***
	(-28.63)	(-29.93)	(-33.00)	(-32.05)	(-31.05)	(-35.74)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Investment category fixed effects	No	Yes	No	No	Yes	No
Fund fixed effects	No	No	Yes	No	No	Yes
Observations	2,225,485	2,225,485	2,225,342	1,944,018	1,944,018	1,943,920
Adjusted R^2	0.063	0.070	0.114	0.073	0.080	0.125

Appendix

A Variable description

This table describes all variables used in the empirical analyses. Data sources are as follows:

1. CRSP Fund: CRSP Survivorship-Bias-Free Mutual Fund Database
2. MS Fund: Morningstar Direct
3. MC: Variable is manually constructed by the authors.

Variable name	Description	Data Source
$\text{Attrition}_{i,t}$	Historical attrition of fund i as of month t, calculated as $$Attrition_{i,t} = 1 - \frac{TNA_{i,t}}{Historical\,max\,fund\,size_{i,t}}.$$	CRSP Fund, MC
Average expense rank of other funds in $\text{family}_{i,t}$	Value-weighted average of the expense ranks of other funds in the same fund family that holds fund i	CRSP Fund, MS Fund, MC
$\text{Cheap family}_{f,t}$	Dummy variable equal to one if family f has a cheap member fund	CRSP Fund, MS Fund, MC
$\text{Cheap fund}_{i,t}$	Dummy variable equal to one if the fund is in the bottom quintile of the constructed expense rank or the MS expense rank	CRSP Fund, MC
Cheap fund in $\text{family}_{i,t}$	Dummy variable equal to one if the fund is not defined as cheap but belongs to a fund family with a cheap fund	CRSP Fund, MS Fund, MC
Constructed expense $\text{rank}_{i,t}$	Expense rank nomalized from 0 to 1 by comparing fund expenses within funds with the same share class and CRSP investment objective	CRSP Fund, MS fund, MC
Expense $\text{ratio}_{i,t}$	Expense ratio of fund i from the latest fiscal year end in month t	CRSP Fund
Expense ratio $\text{dispersion}_{f,t}$	Standard deviation of expense ratios across funds in a fund family	CRSP Fund, MC
Family adjusted $\text{returns}_{f,t}$	Value-weighted average of the member fund previous objective-adjusted returns	CRSP Fund, MS Fund, MC
Family expense $\text{ratio}_{f,t}$	Value-weighted average of the member fund expense ratios	CRSP Fund, MS Fund, MC
Family $\text{flow}_{f,t}$	Net family flows calculated as in Equation 3	CRSP Fund, MS Fund, MC

Variable name	Description	Data Source
Family front load$_{f,t}$	Average front load of member funds of family f	CRSP Fund, MS Fund, MC
Family marketing expenses$_{i,t}$	Average marketing expenses of other funds in the same fund family of fund i	CRSP Fund, MS Fund, MC
Family past performance$_{f,t}$	Average past performance ranks of member funds in family f	CRSP Fund, MS Fund, MC
Family TNA$_{f,t}$	Sum of total net assets of funds in a fund family	CRSP Fund, MS Fund, MC
Family turnover$_{f,t}$	Value-weighted average of the member fund turnover ratios	CRSP Fund, MS Fund, MC
Family size$_{f,t}$	Log of Family TNA	CRSP Fund, MS Fund, MC
Fund age$_{i,t}$	Log of fund age in years	CRSP Fund, MC
Fund flows$_{i,t}$	Net fund flows calculated as in Equation 2	CRSP Fund, MC
Fund performance$_{i,t}$	Rank of monthly adjusted returns over the previous 12 months	CRSP Fund, MC
Fund return volatility$_{i,t}$	Standard deviation of fund monthly returns in previous 12 months	CRSP Fund
Fund size$_{i,t}$	Log of fund TNA	CRSP Fund, MC
Marketing expenses$_{i,t}$	12b-1 fees plus one-seventh of the front loads (Huang et al. (2007))	CRSP Fund, MC
Morningstar (MS) expense rank$_{i,t}$	Expense rank nomalized from 0 to 1 by comparing fund expenses within funds with the same Morningstar categories and distribution channels, following the Morningstar methodology	CRSP Fund, MS Fund, MC
Number of funds in family$_{f,t}$	The number of funds in the fund family	CRSP Fund, MS Fund, MC
Number of investment objectives$_{f,t}$	Log of the number of investment objectives in family f	CRSP Fund, MS Fund, MC
Performance of other funds in family$_{i,t}$	Average past performance ranks of other funds in the same fund family of fund i	CRSP Fund, MC
Performance star (dog)$_{i,t}$	Dummy variable equal to one if the performance of fund i is in the top (bottom) 5% among all funds with the same CRSP investment objective and share class (Nanda et al. (2004))	CRSP Fund, MC
Previous adjusted returns$_{i,t}$	Accumulated fund monthly net returns adjusted by the average returns in the same share class and objective	CRSP Fund, MC
TNA$_{i,t}$	Total net assets in million dollars	CRSP Fund
Previous return$_{i,t}$	Accumulated fund monthly net returns over the previous 12 months	CRSP Fund, MC
Turnover$_{i,t}$	Annual fund turnover	CRSP Fund

Variable name	Description	Data Source
Return dispersion in family$_{f,t}$	Standard deviation in the returns of member funds in fund family f in month t	CRSP Fund, MS Fund, MC
Star (dog) in family$_{i,t}$	Dummy variable equal to one if fund i is not a star (dog) fund but there is a star (dog) fund in the fund family of fund i (Nanda et al. (2004))	CRSP Fund, MS Fund, MC
Turnover$_{i,t}$	Fund annual turnover ratio	CRSP Fund

B Top 20 cheapest fund families

This table lists the top 20 cheapest mutual fund families. Panel A contains the 20 fund families that have the lowest expense rank as defined in Section 2.2 and Panel B contains the 20 fund families that have the highest percentage of cheap funds. Cheap funds are defined as the bottom expense quintile when the expenses are compared within the same share classes and CRSP investment objectives.

Panel A: Rank according to the expense rank

Family name	Constructed expense rank	Family name	Morningstar rank
PFM ASSET MANAGEMENT LLC	1.59%	FIRST FIDELITY BANK NANJ	4.31%
MORNINGSTAR INVESTMENT MANAGEMENT LLC	4.56%	NUMERIC INVESTORS P.	4.70%
AON SECURITIES CORPORATION	5.26%	TD WATERHOUSE ASSET MANAGEMENT	4.98%
GE ASSET MANAGEMENT	7.22%	ASTRA MANAGEMENT CORP.	6.01%
BAILLIE GIFFORD OVERSEAS LTD	7.39%	GE ASSET MANAGEMENT	6.77%
CITIBANK N.A.	7.68%	LINDNER ASSET MANAGMENT INC.	6.82%
CONSTELLATION INVESTMENT MGMT COMPANY	9.02%	RESERVE DIVIDEND FACTORS	8.07%
KLEINWORT BENSON INVESTMENT MGMT AMERICAS INC	10.39%	CHARLES SCHWAB INVSTMENT MANAGEMENT INC	8.88%
VALMARK ADVISERS INC	10.44%	VANGUARD GROUP OF INVESTMENT CO.	9.07%
VANGUARD GROUP OF INVESTMENT CO.	11.06%	RYBACK MANAGEMENT CORP.	9.09%
CAPITAL ADVISORS INC	11.86%	MORNINGSTAR INVESTMENT MANAGEMENT LLC	9.22%
CAPITAL RESEARCH AND MANAGEMENT COMPANY	12.27%	CURIAN CAPITAL LLC	9.26%
GRANTHAM MAYO VAN OTTERLOO & CO LLC	12.45%	GUINNESS FLIGHT INVESTMENT LTD	9.57%
GOVERNORS GROUP ADVISORS	12.72%	INVESTEC ASSET MGMT US LTD	9.76%
BARCLAYS GLOBAL FUND ADVISORS	13.03%	BZW BARCLAYS GLOBAL FUND ADVISORS	9.97%
TIAA-CREF	13.60%	TIAA-CREF	11.48%
STANDISH AYER & WOOD INVESTMENT TRUST	15.27%	WESTCORE FUNDS	11.52%
RYBACK MANAGEMENT CORP.	15.53%	FBR FUND ADVISERS INC	12.53%
LEHMAN BROTHERS GLOBAL ASSET MGMT	15.63%	BRINSON PARTNERS INC.	12.64%
CALLAHAN CREDIT UNION FINANCIAL SERVICES	15.64%	FIRST PACIFIC ADVISORS INC	12.68%

Panel B: Rank according to cheap fund percentage

Family name	Number of cheap funds	Number of funds	Percentage of cheap funds
MORNINGSTAR INVESTMENT MANAGEMENT LLC	8	8	100%
KIEWIT INVESTMENT MANAGEMENT CORP.	5	5	100%
BAILLIE GIFFORD OVERSEAS LTD	13	15	96%
CONSTELLATION INVESTMENT MGMT COMPANY	12	12	91%
GRANTHAM MAYO VAN OTTERLOO & CO LLC	47	51	88%
GOVERNORS GROUP ADVISORS	4	5	87%
WELLINGTON MANAGEMENT COMPANY LLP	5	6	83%
CAPITAL GROUP	5	6	83%
FISCHER FRANCIS TREES & WATTS INC	5	6	82%
VANGUARD GROUP INC	184	150	82%
CALLAHAN CREDIT UNION FINANCIAL SERVICE	4	5	75%
GRIFFIN FINANCIAL INVESTMENT ADVISERS	4	10	74%
LEHMAN BROTHERS GLOBAL ASSET MGMT	11	11	73%
VALMARK ADVISERS INC	5	12	71%
FIRST TENNESSEE BANK	5	6	71%
AON SECURITIES CORPORATION	4	6	67%
GE ASSET MANAGEMENT INC	14	34	66%
DODGE & COX	4	5	66%
JACKSON NATIONAL ASSET MANAGEMENT LLC	72	76	64%
AQR CAPITAL MANAGEMENT LLC	16	17	61%

C Correlations

This table shows pairwise correlation coefficients between all variables use in my analysis. A detailed description of all variables is provided in Appendix A. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Expense rank (1)	1.000											
Expense rank MS (2)	0.685***	1.000										
Average MS expense rank of other funds in family (3)	0.379***	0.317***	1.000									
Average expense rank of other funds in family (4)	0.289***	0.320***	0.713***	1.000								
Fund performance rank (5)	-0.045***	-0.054***	-0.053***	-0.026***	1.000							
Expense ratio (6)	0.513***	0.510***	0.267***	0.233***	-0.037***	1.000						
Family expense (7)	0.322***	0.300***	0.629***	0.711***	-0.023***	0.479***	1.000					
Flow volatility (8)	0.050***	0.005***	0.027***	-0.009***	0.002***	0.390***	0.136***	1.000				
Fund size (9)	-0.275***	-0.320***	-0.216***	-0.145***	0.108***	-0.366***	-0.209***	-0.054***	1.000			
Family size (10)	-0.252***	-0.220***	-0.576***	-0.499***	0.049***	-0.190***	-0.483***	-0.053***	0.277***	1.000		
Turnover (11)	0.131***	0.125***	0.075***	0.053***	-0.008***	0.157***	0.098***	0.009***	-0.094***	-0.061***	1.000	
Fund age (12)	-0.014***	-0.072***	0.003***	-0.005***	0.022***	-0.119***	-0.096***	-0.091***	0.351***	0.115***	-0.060***	1.000

D Effect of cheap funds in family on flows and flow-performance sensitivity at the family level - Non-linear model

This section contains robustness checks of results on family level flows (Table 6) using the piecewise linear model. The dependent variable is Family flow. The main independent variables and control variables are the same as in Table 6. Family past performance is measured by the value-weighted average of the performance rank of the funds in the fund family. The fractional rank for observations in the bottom performance quintile (Bottom performance) is defined as Min(Rank$_{t-1}$, 0.2). Observations in the three medium performance quintiles (Middle performance) are defined as Min(0.6, Rank$_{t-1}$). The rank for the top performance quintile (Top performance) is defined as (Rank$_{t-1}$−Bottom performance−Middle performance). Independent variables are all lagged by one month. t-statistics are provided in parentheses. Standard errors are clustered by fund and time. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Expense rank:	Dependent variable: Fund flows			
	Constructed		Morningstar	
	(1)	(2)	(3)	(4)
Cheap fund in family × Bottom family performance	0.606	-0.396	-4.610**	-5.977***
	(0.30)	(-0.21)	(-2.20)	(-2.97)
Cheap fund in family × Middle family performance	-0.208	0.068	-0.125	-0.085
	(-0.47)	(0.15)	(-0.31)	(-0.21)
Cheap fund in family × Top family performance	-3.624*	-4.397**	-0.112	-0.802
	(-1.79)	(-2.22)	(-0.05)	(-0.34)
Cheap fund in family	-0.230	-0.112	0.704**	0.945***
	(-0.65)	(-0.35)	(2.02)	(2.85)
Bottom family performance	-7.097	-11.623*	-5.545	-10.062
	(-0.98)	(-1.74)	(-0.78)	(-1.53)
Middle family performance	1.027	1.656	0.642	1.343
	(1.06)	(1.45)	(0.64)	(1.17)
High family performance	7.331	5.587	8.424	6.605
	(1.04)	(0.69)	(1.16)	(0.81)
Log family TNA × Bottom family performance	0.421	0.794	0.880	1.351**
	(0.63)	(1.25)	(1.35)	(2.11)
Log family TNA × Middle family performance	-0.007	-0.074	0.016	-0.038
	(-0.07)	(-0.68)	(0.17)	(-0.41)
Log family TNA × Top family performance	-0.911	-0.644	-1.417**	-1.141*
	(-1.45)	(-0.86)	(-2.44)	(-1.71)
Family expense × Bottom family performance	5.551**	6.970***	4.278**	5.234**
	(2.50)	(2.74)	(2.00)	(2.13)
Family expense × Middlefamily performance	0.203	-0.142	0.293	-0.039
	(0.47)	(-0.28)	(0.67)	(-0.08)
Family expense × Top performance	8.168***	8.087**	8.945***	8.797**
	(2.74)	(2.39)	(2.98)	(2.56)
Family expense ratio	-1.517***	-0.757	-1.241***	-0.453
	(-3.93)	(-1.24)	(-3.32)	(-0.74)
Log family TNA	-0.050	-0.437***	-0.132	-0.537***
	(-0.41)	(-2.78)	(-1.13)	(-3.33)
Family turnover	-0.000	0.001	-0.001	0.001
	(-0.62)	(0.43)	(-0.76)	(0.43)
Return SD in family	0.082	0.071	0.082	0.078
	(1.54)	(1.20)	(1.58)	(1.30)
Log number of investment objectives in family	-0.253**	-0.141	-0.284**	-0.167
	(-2.19)	(-0.64)	(-2.49)	(-0.70)
Family front load	-0.051	-0.166*	-0.048	-0.164*
	(-1.43)	(-1.85)	(-1.32)	(-1.80)
Time fixed effects	Yes	Yes	Yes	Yes
Fund family fixed effects	No	Yes	No	Yes
Observations	42,826	42,821	42,133	42,129
Adjusted R^2	0.063	0.101	0.066	0.105

E Attrition as a measure for fund flow-performance sensitivity

This section presents the results of the analysis using the attrition measure in Christoffersen and Musto (2002) and Christoffersen and Xu (2017) as a measure for fund flow-performance sensitivity. The dependent variable is the attrition measure, which is calculated as

$$Attrition_{i,t} = 1 - \frac{TNA_{i,t}}{Historical\,max\,fund\,size_{i,t}}.$$

The main independent variables are the expense rank and the average expense rank of other funds in the family, which follow the same definitions in 2. Control variables include past fund performance, Fund size, Family size, fund turnover, and Fund age, which are all defined in A. t-statistics are provided in parentheses. The standard errors are clustered by fund and time. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variable: Attrition					
Expense rank:	Constructed			Morningstar		
	(1)	(2)	(3)	(4)	(5)	(6)
Expense rank	0.066***	0.073***	0.004	0.062***	0.058***	-0.006
	(11.34)	(13.72)	(0.70)	(10.01)	(10.35)	(-1.09)
Average expense rank of other funds in family	-0.034***	-0.036***	-0.013	-0.041***	-0.026**	-0.002
	(-2.89)	(-3.37)	(-1.21)	(-3.55)	(-2.47)	(-0.20)
Fund performance	-0.110***	-0.111***	-0.092***	-0.108***	-0.111***	-0.093***
	(-21.64)	(-23.08)	(-35.08)	(-20.12)	(-21.81)	(-34.75)
Log fund TNA	-0.055***	-0.057***	-0.169***	-0.054***	-0.056***	-0.168***
	(-45.49)	(-54.28)	(-87.74)	(-40.65)	(-49.57)	(-83.19)
Log family TNA	0.002**	0.005***	0.004**	0.001	0.003***	0.004**
	(2.06)	(4.46)	(2.16)	(0.51)	(2.80)	(2.03)
Turnover	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(21.31)	(13.64)	(3.42)	(20.15)	(12.76)	(2.94)
Log fund age	0.207***	0.215***	0.299***	0.211***	0.218***	0.301***
	(50.29)	(58.84)	(47.72)	(47.84)	(55.01)	(45.88)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Investment category fixed effects	No	Yes	No	No	Yes	No
Fund fixed effects	No	No	Yes	No	No	Yes
Observations	2,247,189	2,247,188	2,246,931	1,961,351	1,961,350	1,961,183
Adjusted R^2	0.277	0.369	0.797	0.276	0.373	0.795

F Effect of expense rank of other funds in family on fund flows and flow-performance sensitivity after controlling for marketing expenses - Linear model

This section contains results of linear models after controlling for the marketing expenses (Talbe 2). The dependent variable is Fund flows. The marketing expenses are defined as the 12b-1 fees plus one-seventh of the front loads. The family marketing expenses take the value-weighted average of the marketing expenses of funds in the fund family. The main independent variables and other control variables are the same as in Table 2. t-statistics are provided in parentheses. Standard errors are clustered by fund and time. $***$, $**$, and $*$ represent statistical significance at the 1%, 5%, and 10% levels, respectively. The results in this table show that the marketing expenses of other funds in the family do not influence the fund flow-performance sensitivity. The coefficient estimates of *Family marketing expenses* are positive but only statistically significant in a few models. I find weak evidence of the positive spillover effect of marketing in a fund family. Controlling for the marketing expenses of the fund and other funds in the same fund family does not change the baseline results. Specifically, the effect of the average expense rank of other funds in family on flow-performance sensitivity and fund flows remains at a similar level compared to Table 2.

Expense rank:	Dependent variable: Fund flows					
	Constructed			Morningstar		
	(1)	(2)	(3)	(4)	(5)	(6)
Average expense rank of other funds in family × Fund performance	1.374***	1.393***	1.508***	1.326***	1.392***	1.553***
	(5.09)	(5.33)	(5.94)	(5.27)	(5.60)	(6.59)
Expense rank × Fund performance	0.168	0.297**	0.336***	0.314**	0.238**	0.270**
	(1.32)	(2.35)	(2.67)	(2.59)	(1.98)	(2.29)
Expense rank	-0.277***	-0.493***	-0.438***	-0.219***	-0.200***	-0.177**
	(-3.86)	(-6.85)	(-4.64)	(-3.20)	(-2.92)	(-2.00)
Average expense rank of other funds in family	-0.605***	-0.488***	-0.269	-0.688***	-0.528***	-0.522***
	(-3.81)	(-3.17)	(-1.11)	(-5.10)	(-3.95)	(-3.06)
Fund performance	3.711***	3.649***	2.284***	4.153***	4.265***	2.867***
	(9.44)	(9.38)	(5.46)	(10.45)	(10.69)	(6.74)
Marketing expenses × Fund performance	0.662***	0.626***	0.741***	0.599***	0.598***	0.679***
	(6.34)	(6.12)	(6.96)	(5.44)	(5.57)	(6.21)
Marketing expenses	-1.173***	-0.401***	-0.120	-1.139***	-0.432***	-0.156*
	(-19.73)	(-6.09)	(-1.54)	(-18.20)	(-6.36)	(-1.96)
Average marketing expenses in the family × Fund performance	0.151	0.122	-0.120	0.005	-0.049	-0.225
	(0.96)	(0.78)	(-0.76)	(0.03)	(-0.29)	(-1.34)
Family marketing expense	0.053	0.198**	0.118	0.133	0.235**	0.149
	(0.60)	(2.25)	(1.01)	(1.42)	(2.48)	(1.20)
Family size × Fund performance	0.015	0.025	0.037	-0.010	-0.008	0.015
	(0.60)	(0.98)	(1.42)	(-0.41)	(-0.33)	(0.57)
Attrition × Fund performance	-0.840***	-0.833***	-0.876***	-0.913***	-0.884***	-0.894***
	(-5.57)	(-5.66)	(-6.19)	(-6.05)	(-6.02)	(-6.48)
Log fund age × Fund performance	-1.058***	-1.066***	-0.676***	-1.053***	-1.072***	-0.721***
	(-15.16)	(-15.45)	(-9.35)	(-14.73)	(-15.06)	(-9.68)
Fund flow volatility	0.020	-0.053*	-0.097***	0.045*	-0.054*	-0.095***
	(0.81)	(-1.73)	(-3.01)	(1.90)	(-1.77)	(-2.95)
Log fund TNA	-0.129***	-0.189***	-1.426***	-0.124***	-0.175***	-1.372***
	(-13.41)	(-20.03)	(-37.32)	(-12.72)	(-17.95)	(-35.86)
Log family TNA	0.041***	0.071***	0.071***	0.042***	0.083***	0.068***
	(2.87)	(5.02)	(2.92)	(3.05)	(5.97)	(2.69)
Turnover	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(6.41)	(5.84)	(2.84)	(7.42)	(5.55)	(2.93)
Log fund age	0.055	0.047	-1.091***	0.102**	0.076*	-1.104***
	(1.30)	(1.14)	(-13.43)	(2.43)	(1.83)	(-13.53)
Attrition	-2.997***	-2.812***	-5.510***	-3.151***	-2.896***	-5.701***
	(-33.18)	(-31.86)	(-34.94)	(-35.87)	(-32.53)	(-37.34)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Investment category fixed effects	No	Yes	No	No	Yes	No
Fund fixed effects	No	No	Yes	No	No	Yes
Observations	2,246,749	2,246,748	2,246,492	1,961,066	1,961,065	1,960,898
Adjusted R^2	0.062	0.069	0.115	0.072	0.079	0.125