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Why are some mutual funds closed to new investors?

Xinge Zhao *

School of Business Administration, P.O. Box 8795, College of William & Mary, Williamsburg, VA 23187, USA

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Abstract

Fund families typically claim that closing a fund protects the fund's superior performance by preventing it from growing too large to be managed efficiently. Even though funds with better performance and larger size are more likely to be closed, there is no evidence that closing a fund can indeed protect its performance. Instead, fund closing decisions are more likely to be motivated by spillover effects – by closing a star fund, the fund family signals its superior performance and also brings investors' attention and investments to other funds in the family. Some evidence exists to suggest that the closing strategy is effective in generating higher inflows into the rest of the family, at least in the short run.

JEL classification: G23
Keywords: Mutual funds; Fund closing; Spillover effects; Fund family strategy

1. Introduction

In recent years, an increasing number of mutual funds have become closed to new investors. These closed funds no longer accept money from new investors and operate only with their current assets and new investments from existing shareholders. Some of the most famous examples include the 1997 closing of Fidelity Magellan Fund, the largest mutual fund in the US; and the 2000 closing of Turner Micro Cap Growth Fund, the best performing small-cap growth fund of 1999.

* Tel.: +1-757-221-3267; fax: +1-757-221-2937.
E-mail address: xinge.zhao@business.wm.edu (X. Zhao).

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Because a fund family's decision to voluntarily close a fund limits the fund's ability to enlarge its asset base, the choice to do so creates an interesting phenomenon for analysis. Mutual fund families are compensated by charging shareholders annual fees, which are expressed as a percentage of a fund's total assets. Therefore, the fund family's revenue should be positively linearly related to the fund's total assets under management. Such an asset-based compensation scheme, as discussed by Chevalier and Ellison (1997), should give fund families an incentive to take actions that increase the inflow of investments to maximize the fund's total assets.

Yet, the reason most often given by a fund family when a fund closing decision is announced is that the closing will help maintain the fund's good performance, since otherwise it would have become too large to be managed efficiently. [1] The validity of such an explanation relies on the relation between fund size and performance. Perold and Salomon (1991) and Indro et al. (1999) both conclude that fund performance may deteriorate when a fund exceeds its optimal size, because diseconomies of scale are associated with the costs of researching and trading on information. Such conclusions are supported by research on the impact of portfolio size on trading costs. Portfolios with larger sizes tend to have higher average trading costs because the trading of large blocks of stocks has tremendous adverse impacts on stock prices by bidding up prices when buying and driving down prices when selling (see, e.g., Loeb, 1983; Keim and Madhavan, 1996; Keim and Madhavan, 1998). In addition, Edelen (1999) documents a negative relation between a fund's abnormal return and investor flows, which suggests that a fund's performance will deteriorate if large influx of new capital forces the fund managers to engage in liquidity-motivated trading.

Considering the findings on the impact of fund size and inflows on performance, the fund families appear to make a legitimate argument. By closing a fund, it would seem, they can make the fund immune from heavy inflows and prevent it from growing too big, thereby sustaining its good performance. However, as shown in Manakyan and Liano (1997), closed funds perform better prior to closing than they do afterwards; in addition, closed funds outperform the control portfolios of funds prior to closing but not afterwards. These findings indicate that the closing strategy does not appear successful in maintaining the good performance of a fund, casting doubts on the true motives of fund families in their closing decision. Furthermore, even if the closing strategy were successful, a natural question would still follow: why do fund families want to keep a fund's good performance at the expense of the management fees collected from the fund? Since fund families are profit-maximizing

[1] See Appendix A for samples of press releases issued by fund families when they announce fund closings. I have also found that some families may close a fund to new investors right before they terminate the fund through either liquidation or merger, which occurs within a quarter after closing. In the preparation for liquidation or merger, according to industry sources, closing a fund facilitates the operation because no new money needs to be invested and no outstanding orders will exist at the time of liquidation or merger. In these cases, closing a fund is not a stand-alone decision but the prelude of a carefully designed liquidation or merger plan. Based on my interviews with the corresponding fund families, I identify such closings and find these funds substantially different from funds involved in stand-alone closings. As a result, I exclude such closings from the analyses of this paper.

economic agents, it is doubtful that the closing decision is made completely out of altruism to optimize the interests of fund shareholders. Naturally, then, one wonders what benefit the fund families may obtain from these fund closing decisions.

The individual portfolio managers of the fund may benefit from the fund closing if it might indeed prevent fund performance from deteriorating, since their compensation is most often linked to fund performance. However, the decision to close a fund does not rest in the hands of individual portfolio managers but in those of the senior executives and board of directors (trustees) of the fund family. Thus, this line of reasoning also fails to explain the fund closing decision.

The burgeoning literature on spillover effects, however, may provide guidance to the study of the true motives of fund families. Nanda et al. (2002) document the existence of spillover effects – a star fund with superior performance in a fund family may generate greater cash inflows not only to the star fund itself but to other funds in the family as well. Khorana and Servaes (2002) provide evidence that the presence of a star fund has a strong positive spillover effect on fund family market share. Ivkovic (2002) captures a statistically and economically significant spillover effect of the overall family performance instead of just a star fund. In addition, Massa (2003) also claims that investors may pay more attention to the family a fund belongs to than to the fund-specific characteristics.

Spillover effects may provide strong incentives for fund families to close a star fund to signal and broadcast its superior performance, which itself may attract investors to other funds in the family. In addition, as shown in Appendix A, closing decisions are marketed to investors as responsible behavior enacted to protect shareholders' interests. Some fund families will also use fund closing as an opportunity to explicitly promote other funds in the family. [2] All of these factors serve to increase the demand for other funds in the same family.

Consequently, this paper studies the closing decision from the perspective of the fund family, similar to the approach taken by Khorana and Servaes (1999) in their study of mutual fund starts. Although the number of closed funds is still fairly small compared to the number of funds in the entire fund universe, the economic significance of this phenomenon should not be underestimated, considering that the short list of closed funds includes some of the best-known funds and fund families as noted earlier. In addition, this study provides a unique opportunity to investigate the spillover effects from a new angle and to shed greater light on the motives of fund families in general. [3]

[2] For example, in the June 28, 2002 press release of the closing of the ING International Value Fund, Bob Boulware, CEO and President of ING Funds Distributor, Inc. also declared: "For investors who are interested in exploring other opportunities in the international sector, ING Funds has several intriguing alternatives for their investment dollars".

[3] Partly due to the fact that large-scale fund closing is a fairly new phenomenon, little research has been done on this issue. The only published study directly relevant to this topic is the paper by Manakyan and Liano (1997), which compares the performance of mutual funds before and after closing. However, the possible reasons for fund closings are not investigated in the paper.

As in Wermers (2000) and Nanda et al. (2002), this paper also adjusts for multiple share classes of the same fund to avoid possible double counting of fund closings. [4] I focus on the closing of a fund instead of individual share classes. A fund is considered closed if and only if all the share classes of the fund are closed. [5]

Based on a new data set from 1992 to 2001 of all equity funds, bond funds, and funds investing in both equities and bonds, I find that funds with better performance, larger size, and higher inflows are more likely to be closed. Better performance in investment objectives also increases closing probability. An average small company growth fund is found to be about four times as likely to be closed as an average fund in other investment objectives. While these findings are consistent with the fund families' claims that they close funds to protect them from heavy inflows, to prevent them from growing too big, and to ultimately preserve their good performance, I do not find any evidence that closing a fund may indeed protect its good performance.

Instead, I find some evidence to suggest that spillover effects may play a role in a fund family's closing decisions. For closed funds, the inflows to the rest of the family are at best mediocre before closing but show signs of improvement after closing, at least in the short run. Large fund families are more likely to pursue the closing strategy, presumably because spillover effects may influence a greater number of funds. In addition, fund families systematically supplement closed funds with new ones, thereby increasing the number of funds that can benefit from the spillover effects.

The remainder of the paper is organized as follows. Section 2 outlines the data and provides summary statistics. Section 3 discusses the methodology, hypotheses, and estimation results. Section 4 concludes.

2. Data and summary statistics

A new data set of quarterly data from the first quarter of 1992 to the third quarter of 2001 of open-end mutual funds is created using the CRSP Survivor-Bias Free US Mutual Fund Database. The data set covers all equity funds, bond funds, and funds

[4] For example, in the Dreyfus Fund Family, Dreyfus Premier Aggressive Growth Fund offers the following four share classes – Dreyfus Premier Aggressive Growth Fund A, Dreyfus Premier Aggressive Growth Fund B, Dreyfus Premier Aggressive Growth Fund C, and Dreyfus Premier Aggressive Growth Fund R. Each of these share classes has the same portfolio manager, the same pool of securities, and the same returns before expenses and loads. The major difference among the four share classes is the varying load structures, which make them attractive to different investors. The multiple-share-class structure also allows fund families to offer share classes through different brokers to reach as many investors as possible.

[5] If the closing of each share class is counted as a unique decision, a serious double counting problem may exist. The different share classes of the same fund may be closed at the same time, thereby creating perfectly correlated events. For instance, the three classes (A, B, and C) of Oppenheimer Enterprise Fund were all closed in March 1996.

investing in both equities and bonds. All funds are categorized in 19 investment objectives primarily based on the ICDI's Fund Objective Code, which indicates the fund's investment strategy as identified by Standard & Poor's Fund Services. [6] The data include: fund name, fund family (management company), inception date, fund age (months), quarterly return, NAV (net asset value), expense ratio, turnover ratio, fund loads (front-end load, back-end load, and 12b-1 fee), and total assets.

In the CRSP mutual fund database, different share classes of the same fund are listed as different funds. Using fund name, NAV, return, and turnover ratio, I identify the share classes of the same fund. [7] The 15,853 share classes in the data set belong to 7500 funds, as depicted in Panel A of Table 1. These funds are almost evenly split between having only one share class and having more than one. These 7500 funds belong to 615 families, tabulated in Panel B of Table 1. While 126 families have just one fund, the remaining 489 families have at least two funds.

Over the 10-year sample, a total of 198 fund closings are recorded. Among them, as noted in Section 1, in addition to 139 stand-alone closings, I identify 27 pre-liquidation and 32 pre-merger closings based on my interviews with the corresponding fund families. [8] The 59 funds all exited within only one quarter after closing, while a half of them (30) exited in the same quarter of closing.

I compute the medians of various characteristics of funds involved in stand-alone closings, pre-liquidation closings, and pre-merger closings, and report the results in Table 2. Among the characteristics, *fund size* is computed as the total assets in the fund at the end of the quarter prior to closing; *quarterly* (*annual*) *objective-adjusted performance* is the fund holding period return in the quarter (four quarters) prior to closing in excess of the asset-weighted average return for all funds with the same investment objective, as used in Khorana (2001) and Jayaraman et al. (2002). Since *fund inflow* is not available directly from the data, I compute *fund inflow* as the asset growth rate net of fund holding period return:

[6] Among all ICDI's Fund Objectives, money market funds (Money Market Tax Free Funds, Money Market Government Securities Funds, and Money Market Taxable Funds) are excluded. So are Special Funds, which are primarily currency funds. Exchange Traded Funds (ETFs), such as SPDRs or iShares, are also excluded, since their operation is very different from that of traditional mutual funds. Utility Funds are combined into Sector Funds. To be consistent with most mutual fund research (see, e.g., Pastor and Stambaugh, 2002; Jayaraman et al., 2002), I also create a separate Small Company Growth Funds objective using the SCG (Small Company Growth Funds) Strategic Insight Fund Objective Code. Most of these funds are identified as Aggressive Growth Funds by ICDI's Fund Objective Codes. For a list of all fund objectives and their description, please refer to Appendix A to the CRSP Survivor-Bias Free US Mutual Fund Database Guide.

[7] For instance, Dreyfus Premier Aggressive Growth Fund has four share classes – Dreyfus Premier Aggressive Growth Fund A, Dreyfus Premier Aggressive Growth Fund B, Dreyfus Premier Aggressive Growth Fund C, and Dreyfus Premier Aggressive Growth Fund R.

[8] Only a few fund families, such as Fidelity and AIM, adopt the strategy to close a fund right before liquidation or merger. Over the 10-year sample, a total of 2036 funds are liquidated or merged, while only 59 of them are closed right before liquidation or merger.

Table 1
Share classes, funds, and fund families

Panel A: Number of share classes in funds

Number of share classes	Number of funds
1	3588
2	1293
3	1136
4	1168
5	293
6	21
8	1
Total	7500

Panel B: Number of funds in fund families

Number of funds	Number of fund families
1	126
2–5	209
6–10	104
11–50	142
51–100	28
101–200	5
223	1
Total	615

Many mutual funds offer multiple share classes. Using fund name, NAV, return, and turnover ratio, I identify the different share classes of the same fund. The 15,853 share classes belong to 7500 funds. These funds are almost evenly split between having only one share class and having more than one. The maximum number of share classes a fund has is eight. These 7500 funds belong to 615 fund families. While 126 families have just one fund, the remaining 489 families have at least two funds.

Table 2
Summary statistics of the closed funds

Fund characteristics	Funds involved in stand-alone closings	Funds involved in pre-liquidation closings	Funds involved in pre-merger closings	Funds that are still open
Size ($ million)	196.57	5.67	32.14	98.50
Quarterly objective-adjusted performance (%)	0.26	0.17	−0.70	−0.08
Annual objective-adjusted performance (%)	2.35	−0.83	−2.23	−0.37
Quarterly inflow (%)	6.68	0.39	−5.38	0.29
Annual inflow (%)	26.48	−4.41	−25.66	1.82

This table presents the medians of various fund characteristics for funds involved in stand-alone closings, pre-liquidation closings, and pre-merger closings, as well as funds that are still open to new investors. *Fund size* is the total assets in the fund at the end of the quarter prior to closing; *quarterly (annual) objective-adjusted performance* is the fund holding period return in the quarter (four quarters) prior to closing in excess of the asset-weighted average return for all funds with the same investment objective; and quarterly (annual) *fund inflow* is the asset growth rate net of quarterly (annual) fund holding period return in the quarter (four quarters) prior to closing.

$$\text{Fund inflow}_{i,t} = (\text{Asset}_{i,t} - (1 + r_{i,t})\text{Asset}_{i,t-1})/\text{Asset}_{i,t-1}, \quad (1)$$

where $\text{Asset}_{i,t}$ is the total assets of fund i at the end of time t, and $r_{i,t}$ is the holding period return of fund i during time t. Both quarterly and annual fund inflows in the quarter (four quarters) prior to closing are calculated. The median values of all these characteristics for all funds that are still open to new investors are also included as a benchmark.

I find sharp contrasts among funds that are still open and funds that are involved in stand-alone closings or pre-liquidation/merger closings. The median size of a fund prior to stand-alone closings ($196.57 million) is twice as large as the median size of a still-open fund ($98.50 million), while the median sizes of funds prior to pre-liquidation and pre-merger closings are only $5.67 million and $32.14 million, respectively. Similar qualitative results can also be observed for annual performance and inflows. A median fund prior to stand-alone closings has much better performance and much higher inflows than a median still-open fund, which, however, still dominates a median fund prior to either pre-liquidation or pre-merger closings in terms of both performance and inflows. These results also verify the pre-liquidation/merger closing identifications obtained from my interviews with the fund families, since the existing literature has shown that liquidated or merged funds have poor performance, small size, and low inflows (see, e.g., Brown and Goetzmann, 1995; Elton et al., 1996; Hendricks et al., 1997; Lunde et al., 1999; Carhart et al., 2002).

Considering the apparent differences in fund families' motives for stand-alone closings and pre-liquidation/merge closings, as well as the sharp contrasts in various characteristics between funds involved in these two types of closings, I exclude pre-liquidation/merger closings from the analyses of this paper and focus on stand-alone closings instead, hereafter referred to only as closings.

Among the 139 closed funds, 97 funds only offer one share class, while the remaining 42 funds have multiple share classes. [9] Table 3 reports the number of closed funds by year and investment objective. A greater number of closings are recorded over the last four years of the sample. A total of 99 funds are closed in 1998, 1999, 2000, and 2001, accounting for 71.2% of all the closings. Equity funds dominate fund closings, with a 68.3% share (95 funds) of the total sample. Comprising more than 25% of all the closings (36 funds), small company growth is by far the most represented investment objective, followed by long-term growth, total return, and international equity, each accounting for 15.1% (21 funds), 8.6% (12 funds), and 7.9% (11 funds) of all the closed funds, respectively.

[9] A multiple-share-class fund is considered closed if and only if all the share classes of the fund are closed.

Table 3
Distribution of closed mutual funds by year and investment objective

Investment objective	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 (as of 9/30/02)	Objective total	% of total closings
Aggressive growth	0	0	0	0	0	0	1	3	1	2	7	5.0
Balanced	0	0	0	0	0	0	0	0	0	1	1	0.7
High quality bond	0	0	0	0	0	0	1	0	0	1	2	1.4
High yield bond	0	0	0	1	0	1	2	1	0	2	7	5.0
Global bond	0	0	0	0	0	0	0	1	0	2	3	2.2
Global equity	0	0	0	0	0	0	0	0	4	2	6	4.3
Growth and income	0	1	2	0	1	0	0	0	0	2	6	4.3
Ginnie Mae	0	0	1	1	0	1	2	1	0	0	6	4.3
Government security	0	0	1	0	0	0	3	1	0	0	5	3.6
International equity	0	1	1	0	0	0	4	1	3	1	11	7.9
Income	0	0	0	0	0	0	0	0	0	0	0	0.0
Long-term growth	0	0	1	0	1	2	4	3	6	4	21	15.1
High quality municipal bond	0	0	1	0	1	0	0	1	0	0	3	2.2
Single state municipal bond	0	0	1	0	0	0	0	1	0	1	3	2.2
High yield municipal bond	0	0	0	0	0	1	1	0	0	0	2	1.4
Precious metals	0	0	0	1	0	0	0	0	0	0	1	0.7
Sector	0	0	0	0	0	0	1	1	2	3	7	5.0
Small company growth	0	1	0	1	4	6	3	6	10	5	36	25.9
Total return	1	2	0	2	0	2	1	3	0	1	12	8.6
Total	1	5	8	6	7	13	23	23	26	27	139	100.0

This table lists the 139 closed funds by year and investment objective. All funds are categorized in 19 investment objectives primarily based on the ICDI's Fund Objective Code, which indicates the fund's investment strategy as identified by Standard & Poor's Fund Services. The Small Company Growth objective is based on the SCG (Small Company Growth Funds) Strategic Insight Fund Objective Code. A greater number of closings are recorded over the last four years of the sample. A total of 99 funds are closed in 1998, 1999, 2000, and 2001, accounting for 71.2% of all the closings. Equity funds dominate fund closings, accounting for 68.3% (95 funds) of the total sample.

3. Methodology, hypotheses, and results

3.1. The statistical model

To investigate the determinants of mutual fund closings, I estimate the following logit model: Let $i = 1, 2, \ldots, n$ denote each fund, $t = 1, 2, \ldots, T$ denote each quarter, $y_{it} = 1$ denote that fund i is closed in quarter t, and $y_{it} = 0$ stand for no closing. The closing decision is made according to the values of a set of family, objective, and fund attributes: [10]

$$\text{Prob}(y_{it} = 1) = \frac{\exp(\beta_j' \mathbf{x_i})}{1 + \exp(\beta_j' \mathbf{x_i})}, \tag{2}$$

$$\begin{aligned}\beta_j' \mathbf{x_i} = {} & \alpha_0 + \beta_1 \text{ (family number of funds)}_{i,t-1} + \beta_2 \text{ (family inflow)}_{i,t-1} \\ & + \beta_3 \text{ (family performance)}_{i,t-1} \\ & + \beta_4 \text{ (objective number of funds)}_{i,t-1} + \beta_5 \text{ (objective inflow)}_{i,t-1} \\ & + \beta_6 \text{ (objective performance)}_{i,t-1} + \beta_7 \text{ (fund size)}_{i,t-1} \\ & + \beta_8 \text{ (fund inflow)}_{i,t-1} + \beta_9 \text{ (fund age)}_{i,t-1} \\ & + \beta_{10} \text{ (fund performance)}_{i,t-1} + \beta_{11} \text{ (fund expense ratio)}_{i,t-1} \\ & + \beta_{12} \text{ (small company growth dummy)}_{i,t-1} + \varepsilon_{i,t},\end{aligned} \tag{3}$$

where *fund size* is the log of the total assets in the fund; *fund age* is the age of the initial share class of the fund; and *fund expense ratio* is the objective-adjusted expense ratio for each fund. *Fund inflow* and *fund performance* are as defined in Section 2. Considering that the small company growth objective is by far the most represented investment objective among all closed funds, I also create a dummy that is set equal to one for small company growth funds and zero otherwise.

To correctly describe the characteristics in the *rest* of the fund family and to perform a clearer test of the importance of family-level factors, for each fund in each time period, I exclude values of the specific fund under consideration when I

[10] In addition to the variables included in the model, many other variables are also considered. However, they are highly correlated to variables already included in the model (correlations > 0.50) and therefore dropped. Family age, total assets, and number of new funds in a family are all highly correlated *to family number of funds*. Family expense ratio is highly correlated *to fund expense ratio*. Total assets and number of new funds in an objective are highly correlated to *objective number of funds*. Correlations between quarterly and annual *fund inflow* and *objective-adjusted performance* are only 0.04 and 0.09, respectively. I also use measures based on Barclay et al. (1998) to compute fund capital gains overhang, which describes the fraction of the total assets of a fund consisting of unrealized capital gains, to test whether tax concerns may affect closing decisions. The variable, which is not correlated to *objective-adjusted fund performance* (correlation = 0.02), does not have a significant effect with various specifications. Therefore, I do not include it in the final model reported in this paper.

calculate family-level variables. As a result, *family number of funds* gives the total number of all other surviving funds in the family; *family performance* provides the asset-weighted average of the objective-adjusted fund returns of all other funds in the family; and *family inflow* is the asset growth rate net of holding period return in the rest of the family. Objective-level variables are calculated in the same fashion. *Objective number of funds* gives the total number of all other surviving funds with the same investment objective; *objective performance* is the asset-weighted average of the fund holding period returns of all other funds with the same investment objective; and *objective inflow* is the asset growth rate net of holding period return for all other funds with the same investment objectives.

To test both the short-term and long-term effects of *performance* and *inflow* factors at all levels, I calculate both a quarterly value and an annual value for these variables. When I calculate annual values, I still group closings by quarters and compute annual values by using quarterly values of the factors in the four quarters prior to the fund closing, rather than grouping closings by year. [11] I believe this method better reflects the long-term effects of the factors studied.

As in Ivkovic (2002) and Nanda et al. (2002), I only use observations for families with more than one fund, because nontrivial family-level variables can only be calculated for funds from such families. Among the 139 closed funds, only eight are the only fund in their families.

3.2. Hypotheses

3.2.1. Protect a fund's good performance

The fund-level variables are included to test whether fund families indeed want to close the funds to protect their good performance. If this argument is true, the closed funds must have good performance to begin with. Therefore, the first hypothesis I will test is that closed funds tend to have better performance, i.e. H_0: $\beta_{10} > 0$ vs. H_A: $\beta_{10} \leqslant 0$, in reference to the coefficient in Eq. (3). (H_0 stands for the null hypothesis, while H_A stands for the alternative hypothesis.)

As noted in the literature review in Section 1, the performance of a fund may deteriorate when the fund exceeds its optimal size or experiences large influx of new capital. If the fund family is concerned with performance deterioration in the future and wants to close the fund to make it immune from heavy inflows and to prevent the fund from growing too big, then the fund must already be large in size and subject to heavy inflows. As a result, I hypothesize that funds with larger sizes and higher inflows are more likely to be closed, i.e. H_0: $\beta_7 > 0$ vs. H_A: $\beta_7 \leqslant 0$, and H_0: $\beta_8 > 0$ vs. H_A: $\beta_8 \leqslant 0$.

As noted in Section 1, by closing a fund, the fund family limits the size of the fund to avoid higher average trading costs that result from the tremendous adverse price

[11] For instance, annual values over the July 1994–June 1995 period are used to predict the likelihood of a fund closing over the subsequent 3-month period, i.e., July 1995–September 1996, while annual values over the October 1994–September 1995 period are used to predict the likelihood of a fund closing over the October 1995–December 1995 period, and so on.

impacts of trading large blocks of stocks. Such trades bid up prices when buying and drive down prices when selling. Keim and Madhavan (1996) document that such adverse price impacts are the most serious when trading stocks with small market capitalization. This finding suggests that, among all investment objectives, the adverse price impacts should be the most serious for small company growth funds, which invest primarily in stocks of small companies with total market capitalization below $2 billion. As a result, I conjecture that a fund family should be most likely to close a small company growth fund, which is the most vulnerable to the adverse price impacts, i.e. H_0: $\beta_{12} > 0$ vs. H_A: $\beta_{12} \leqslant 0$.

When an investment objective has outstanding returns, performance-chasing investors tend to pour money into such an investment objective. As a result, funds in such an investment objective are more likely to have higher inflows and to grow larger. Therefore, I predict that funds in investment objectives with better performance should be more likely to be closed, i.e. H_0: $\beta_6 > 0$ vs. H_A: $\beta_6 \leqslant 0$.

I also include fund age, fund expense ratio, objective number of funds, and objective inflow to test if they may in any way affect fund closings.

3.2.2. Spillover effects to the rest of the family

As noted in Section 1, recent studies document the existence of spillover effects – a star fund with superior performance in a fund family generates greater cash inflows not only to the star fund itself but to other funds in the family as well. Spillover effects may provide strong incentives for fund families to close a star fund to signal and broadcast its superior performance.

If spillover effects play a role in a fund family's closing decisions, I would still expect that better fund performance increases the likelihood of fund closing, i.e. H_0: $\beta_{10} > 0$ vs. H_A: $\beta_{10} \leqslant 0$, because the fund family has stronger incentives to close its fund to signal its superior performance. I also hypothesize that a fund family with a greater number of funds is more likely to pursue the closing strategy, i.e. H_0: $\beta_1 > 0$ vs. H_A: $\beta_1 \leqslant 0$, because such a family has more funds to gain from the spillover effects caused by closing. Press releases associated with fund closings bring investors' attention not only to the superior performance of the closed fund itself but to other funds in its fund family as well. Some fund families, such as the ING Funds mentioned earlier in Footnote 2, will also use the opportunity to explicitly promote other funds in the family. As a result, the greater the number of funds that the fund family offers, the greater the number of funds that may benefit from such promotion by receiving higher inflows. If the forgone fees from fund closing are considered the fixed costs of this strategy, a greater number of funds will apparently make this strategy more likely to be profitable and make the fund family more likely to pursue such a strategy. I also conjecture that a family is more likely to close a star fund if the performance and inflows in the rest of the family are either poor or mediocre, i.e. H_0: $\beta_2 \leqslant 0$ vs. H_A: $\beta_2 > 0$, and H_0: $\beta_3 \leqslant 0$ vs. H_A: $\beta_3 > 0$, since such a family has the urgent need to exploit the spillover effects.

3.3. Estimation results

Panel A of Table 4 reports the results from the logit model, using annual values for *performance* and *inflow* variables. [12] To examine the robustness of the results, I estimated four models with different specifications. Model (i) only includes fund-level variables, while Model (ii) uses all family-level, objective-level, and fund-level variables. Model (iii) and Model (iv) are implemented without *objective performance* and *objective inflow*, respectively, due to their relatively high correlations (correlation between annual *objective performance* and *objective inflow* is 0.34, while correlation between quarterly *objective performance* and *objective inflow* is 0.28). For each model specification, quarter dummies are also included (not reported).

To examine the goodness-of-fit of the logit models, I compare the actual closing frequency with predicted closing probabilities estimated from the models when all the variables are set equal to their means and medians, respectively. These findings are reported in Panel B of Table 4. In Model (i), the actual closing frequency is 0.07%, while the mean and median predicted probabilities are 0.06 and 0.05%, respectively. Identical results are obtained for Models (ii), (iii), and (iv). Hence, the mean and median predicted probabilities are very similar to the actual closing frequencies, suggesting that the models fit the data quite well.

The nonlinear nature of the logit model determines that the degree to which the probability of closing may change if a variable changes by a certain amount cannot be simply answered by the coefficients estimated. To measure economic significance, following the method used by Khorana and Servaes (1999), I obtain the percentage changes in the probability of closing when a variable is increased by one standard deviation, for all variables when they are set equal to their means, except for the small company growth dummy variable. For the small company growth dummy variable, I compute the percentage change in the probability of closing when the dummy increases from zero to one, while all other variables are still set equal to their means.

Across all model specifications, *fund size*, *inflows*, and *performance* all have statistically significant positive effects on the closing decision. A one standard deviation increase of *fund size* (*performance*) can increase the closing probability by around 40% (17%). These results are consistent with my hypotheses that funds with better performance, larger size, and higher inflows are more likely to be closed. As predicted, better performance in investment objectives also significantly increases

[12] *Since fund inflow* is defined as asset growth rate, *the fund inflow* measure can be extremely high when total assets at the end of the previous period are very low, especially in the early stage of a fund right after inception. These outliers can generate misleading estimates *for fund inflow* in the estimations due to their huge magnitudes. Chan and Lakonishok (1992) claim that deleting outliers provides a more robust estimation of regression coefficients. As a result, similar to the approach used by Edelen (1999), I drop observations with annual fund inflow above 50 (536 observations) and (for symmetry) below −0.85 (554 observations) in Table 4 to eliminate the effects of these outliers. The dropped observations only account for less than 0.3% of the entire sample. I also drop observations with quarterly fund inflow above 10 (492 observations) and below −0.60 (480 observations) when quarterly values for *performance* and *inflow* variables are used instead. Since the same qualitative results are obtained, I omit the extra tables and discussion.

Table 4
Logit model estimates for fund closing decisions using annual data

Panel A: Regression results

Variables	Model (i)			Model (ii)			Model (iii)			Model (iv)		
	Coefficient	*p*-value	Percentage change of probability	Coefficient	*p*-value	Percentage change of probability	Coefficient	*p*-value	Percentage change of probability	Coefficient	*p*-value	Percentage change of probability
Family-level												
Number of funds				0.005**	0.012	23.16	0.005**	0.012	23.23	0.005**	0.011	23.37
Inflow				−0.003	0.742	−51.46	−0.003	0.723	−53.99	−0.003	0.719	−53.17
Performance				1.152***	0.010	9.91	1.221***	0.006	10.53	1.156***	0.009	9.95
Objective-level												
Number of funds				−0.000	0.357	−9.40	−0.001	0.297	−10.54	−0.000	0.329	−9.92
Inflow				−0.615	0.495	−9.41	0.083	0.921	1.35			
Performance				1.908**	0.012	33.76				1.749**	0.016	30.57
Fund-level												
Size	0.208***	0.001	45.80	0.171***	0.008	36.25	0.179***	0.006	38.16	0.167***	0.009	35.20
Inflow	0.042*	0.052	10.09	0.040*	0.076	9.49	0.041*	0.063	9.84	0.038*	0.089	9.08
Age	−0.002*	0.090	−21.51	−0.002	0.118	−20.21	−0.002	0.120	−20.19	−0.002	0.123	−19.82
Performance	1.380***	0.000	20.63	1.124***	0.000	16.50	1.155***	0.000	16.99	1.126***	0.000	16.53
Expense ratio	15.865**	0.047	9.62	15.649**	0.039	9.49	16.088**	0.030	9.77	15.402**	0.046	9.33
Small company growth dummy	1.630***	0.000	409.63	1.586***	0.000	387.85	1.666***	0.000	428.16	1.566***	0.000	378.05
Intercept	−22.060***	0.000		−22.057***	0.000		−21.998***	0.000		−22.154***	0.000	
Number of observations	155,786			155,430			155,430			155,430		
p-value of regression	0.000			0.000			0.000			0.000		
Panel B: Actual and predicted probabilities (%)												
Actual closing frequency	0.07			0.07			0.07			0.07		
Mean predicted probability	0.06			0.06			0.06			0.06		
Median predicted probability	0.05			0.05			0.05			0.05		

To investigate the determinants of mutual fund closings, I estimate the following logit model: Let $i = 1, 2, \ldots, n$ denote each fund, $t = 1, 2, \ldots, T$ denote each quarter, $y_{it} = 1$ denote that fund i is closed in quarter t, and $y_{it} = 0$ stand for no closing.

Table 4 (*continued*)

$$\text{Prob}(y_{it}=1)=\frac{\exp(\beta_j'\mathbf{x_i})}{1+\exp(\beta_j'\mathbf{x_i})},$$

$$\begin{aligned}\beta_j'\mathbf{x_i}=\alpha_0&+\beta_1\ (\text{family number of funds})_{i,t-1}+\beta_2\ (\text{family inflow})_{i,t-1}+\beta_3\ (\text{family performance})_{i,t-1}+\beta_4\ (\text{objective number of funds})_{i,t-1}+\beta_5\ (\text{objective inflow})_{i,t-1}\\&+\beta_6\ (\text{objective performance})_{i,t-1}+\beta_7\ (\text{fund size})_{i,t-1}+\beta_8\ (\text{fund inflow})_{i,t-1}+\beta_9\ (\text{fund age})_{i,t-1}+\beta_{10}\ (\text{fund performance})_{i,t-1}+\beta_{11}\ (\text{fund expense ratio})_{i,t-1}\\&+\beta_{12}\ (\text{small company growth dummy})_{i,t-1}+\varepsilon_{i,t}.\end{aligned}$$

Family number of funds gives the total number of all other surviving funds in the family; *family inflow* is the asset growth rate net of holding period return in the rest of the family; and *family performance* is the asset-weighted average of the objective-adjusted fund returns of all other funds in the family. *Objective number of funds* gives the total number of all other surviving funds with the same investment objective; *objective performance* is the asset-weighted average of the fund holding period returns of all other funds with the same investment objective; and *objective inflow* is the asset growth rate net of holding period return for all other funds with the same investment objectives. *Fund size* is the log of the total assets in the *fund*; *fund inflow* is the asset growth rate net of fund holding period return; *fund age* is the age of the initial share class of the *fund*; *fund performance* is the fund holding period return in excess of the asset-weighted average return for all funds with the same investment objective; and *fund expense ratio* is the objective-adjusted expense ratio for each fund. The small company growth dummy is set equal to one for small company growth funds and zero otherwise. In addition, quarter dummies are also included (not reported). This table reports the results of using annual *performance* and *inflow* variables at all levels.

I only use observations for families with more than one fund, because nontrivial family-level variables can only be calculated for funds from such families. Among the 139 closed funds, only eight are the only fund in their families. To examine the robustness of the results, I estimated four models with different specifications. Model (i) only includes fund-level variables, while Model (ii) uses all family-level, objective-level, and fund-level variables. Model (iii) and Model (iv) are implemented without *objective performance* and *objective inflow*, respectively, due to their relatively high correlations. To eliminate the effects of outliers, I drop observations with annual fund inflow above 50 (536 observations) and (for symmetry) below −0.85 (554 observations). The dropped observations only account for less than 0.3% of the entire sample.

***, **, and * indicate statistical significance at the 1%, 5%, 10% confidence levels, respectively. To measure economic significance, I obtain the percentage changes in the probability of closing when a variable is increased by one standard deviation (or from zero to one for the small company growth dummy variable), for all variables when they are set equal to their means. To examine the goodness-of-fit of the logit models, I compare the actual closing frequency with predicted closing probabilities when all the variables are set equal to their means and medians, respectively.

closing probability. An improvement of one standard deviation leads to a more than 30% increase in closing probability. The results also provide strong evidence that small company growth funds are the most likely to be closed among all investment objectives. In fact, an average small company growth fund is about four times as likely to be closed as an average fund in other investment objectives. All of these findings are consistent with the fund families' claims that they close those funds with good performance to make them immune from heavy inflows and to prevent them from growing too big. [13] On the other hand, the finding that funds with better performance are more likely to be closed is also consistent with the spillover effects hypothesis.

As expected for family-level variables, I first find that fund families with a large number of funds are more likely to pursue the closing strategy, presumably because a greater number of funds may gain from the spillover effects in such families. If the number of funds in the rest of the family increases by one standard deviation, the closing probability increases by more than 23%. In addition, I also find that fund families systematically supplement closed funds with new ones, thereby increasing the number of funds that can benefit from the spillover effects. These fund families start a total of 255 new funds in the three quarters surrounding the closings of 139 funds, and the fund starts are almost evenly split among the three quarters.

The estimates for family inflow are negative, but not statistically significant. This indicates that poor inflows in the rest of the family will at least not discourage the fund closing decision. Nevertheless, contrary to my prediction, the superior performance of other funds in the family increases the likelihood of fund closing. However, family performance does not appear to have economically significant impact on closing probabilities. In addition, the estimates for family performance become statistically insignificant when I re-estimate the logit models with objective-level and family-level inflow and performance variables constructed as equal-weighted averages of the corresponding funds, while the same qualitative results are obtained for other variables. The discrepancy makes the impact of family performance less reliable. [14] In summary, I find some evidence to suggest that spillover effects may play a role in a fund family's closing decisions.

3.4. The effectiveness of the closing strategy

Does a fund family close a fund to protect its good performance or to generate higher inflows to the rest of the family? Since evidence to support both hypotheses are found in the estimation results, the question cannot be finally answered without examining the effectiveness of the closing strategy on the two purposes.

[13] In addition, the fund expense ratio is also shown to have statistically significant positive effect on the closing decision. However, its economic effect appears to be weak. None of the estimates for other fund-level or objective-level variables are significant across all model specifications.

[14] One potential explanation is that the other funds of the family used to be in the shadow of the closed fund and could not attract investors' attention, and the fund family is trying to direct investors' interests to these funds by closing the once dominant fund.

3.4.1. The effectiveness on protecting performance

To test whether closing a fund may protect its good performance, I follow Sirri and Tufano (1998) and first measure the quarterly performance of a fund as its fractional performance rank (*Rank*), which represents the percentile of its performance relative to other funds with the same investment objective in the same quarter. [15] This relative performance measure is appropriate to use when comparing the performance of a fund before and after closing because it controls for the general market trends in the two time periods. $Rank_{i,t-1}$ represents the performance of a closed fund in the quarter prior to closing, while $Rank_{i,t+1}$ represents the performance of the fund in the quarter after closing. Fractional performance ranks based on annual performance are calculated in the same fashion. I first compute the means of quarterly and annual ranks for all closed funds both before closing and after closing. The results are reported in Panel A of Table 5. On average, closed funds have above average performance among all funds in the quarter and year prior to closing. However, their relative performance eventually deteriorates, especially in the one-year period after closing.

In addition to the simple comparison of means, I also conduct pairwise *t*-tests on the equality of means of fractional performance ranks of closed funds before and after closing, with the alternative hypotheses that ranks after closing are either greater than or less than ranks before closing. As shown by the results in Panel B of Table 5, the hypotheses that quarterly and annual performance have improved after closing are both rejected. In contrast, annual performance is shown to have significantly deteriorated, with a *p*-value of 0.001. The deterioration in quarterly performance is not as significant, with a *p*-value of 0.107. In summary, no evidence can be found to support the statement that closing a fund may protect its good performance. These results are also consistent with Manakyan and Liano (1997), which finds that closed funds perform better prior to closing than they do afterwards; in addition, closed funds only outperform the control portfolios of funds prior to closing but not afterwards.

3.4.2. The effectiveness on generating inflows into the rest of the fund family

To test whether fund closing may generate higher inflows to the rest of the fund family, I estimate the following fixed effects panel regression using pre-closing and post-closing data from the fund families of closed funds:

$$\mathrm{FOINFLOW}_{i,t} = \alpha + \beta_1 \cdot \mathrm{FSIZE}_{i,t-1} + \beta_2 \cdot \mathrm{FOINFLOW}_{i,t-1} + \beta_3 \cdot \mathrm{CDUMMY}_{i,t-1} + u_i + \varepsilon_{i,t}, \quad (4)$$

where FOINFLOW is *family objective-adjusted inflow*, which is calculated as asset-weighted average of the objective-adjusted fund inflows of all funds in the rest of the family of the closed fund; FSIZE is the log of total assets of all funds in the rest of the family; CDUMMY is set equal to one if fund closing occurs in the previous time

[15] The measure takes the values from 0 to 100, with 100 indicating the best performance and 50 indicating the median performance.

Table 5
The effectiveness of the closing strategy on protecting fund performance

Panel A: Fractional performance ranks for all closed funds before and after closing

Fractional performance rank	$Rank_{i,t-1}$	$Rank_{i,t+1}$
Mean of quarterly rank (%)	56.17	51.40
Mean of annual rank (%)	59.80	44.79

Panel B: Pairwise t-tests of equality of performance

Tests	*p*-values
H_0: Mean quarterly $Rank_{i,t+1}$ = Mean quarterly $Rank_{i,t-1}$	
H_{A1}: Mean quarterly $Rank_{i,t+1}$ > Mean quarterly $Rank_{i,t-1}$	0.893
H_{A2}: Mean quarterly $Rank_{i,t+1}$ < Mean quarterly $Rank_{i,t-1}$	0.107
H_0: Mean annual $Rank_{i,t+1}$ = Mean annual $Rank_{i,t-1}$	
H_{A1}: Mean annual $Rank_{i,t+1}$ > Mean annual $Rank_{i,t-1}$	0.999
H_{A2}: Mean annual $Rank_{i,t+1}$ < Mean annual $Rank_{i,t-1}$	0.001

To test whether closing a fund may protect its good performance, I follow Sirri and Tufano (1998) and first measure the quarterly performance of a fund as its fractional performance rank (*Rank*), which represents the percentile of its performance relative to other funds with the same investment objective in the same quarter. $Rank_{i,t-1}$; represents the performance of a closed fund in the quarter prior to closing, while $Rank_{i,t+1}$ represents the performance of the fund in the quarter after closing. Fractional performance ranks based on annual performance are calculated in the same fashion. I first compare the means of quarterly and annual ranks for all closed funds both before closing $(t-1)$ and after closing $(t+1)$. In addition, I also conduct pairwise *t*-tests on the equality of means of fractional performance ranks of closed funds before and after closing, with the alternative hypotheses that ranks after closing are either greater than or less than ranks before closing. The *p*-values represent the probability that the null hypotheses should be accepted.

period, and zero otherwise; and u_i is the family-specific fixed effect for the ith family and is constant through time. The panel regression method is used to account for the fact that the pre-closing and post-closing observations from the same family are not independent relative to each other in this panel data set. Models using quarterly and annual FOINFLOW are both estimated. $\text{FRETURN}_{i,t-1}$, which provides the asset-weighted average of the objective-adjusted fund returns of all funds in the rest of the family, is also considered but not included in the model because it is highly correlated to $\text{FINFLOW}_{i,t-1}$ (the correlation between annual $\text{FRETURN}_{i,t-1}$ and $\text{FOINFLOW}_{i,t-1}$ is 0.640). The estimation results are reported in Table 6.

As shown by the significantly positive estimate of the fund closing dummy using quarterly FOINFLOW, inflows in the rest of the family have apparently improved in the post-closing quarter compared to in the pre-closing quarter. This result is obtained after controlling for the effects of family size and previous inflows. The improvement in family inflows in the post-closing year, however, is not as significant, suggesting that the effectiveness of the fund closing strategy on generating inflows to the rest of the family might be diminishing over time.

In summary, the study of the effectiveness of the fund closing strategy provides no evidence to suggest that closing a fund will help sustain its good performance; on the other hand, there is some evidence that the fund closing strategy improves inflows to

Table 6
The effectiveness of the closing strategy on generating inflows to the rest of the fund family

Variables	Quarterly		Annual	
	Coefficient	*p*-value	Coefficient	*p*-value
FSIZE $(t-1)$	−0.038	0.306	−0.230	0.353
FOINFLOW $(t-1)$	0.183	0.167	−0.506**	0.022
CDUMMY $(t-1)$	0.045**	0.016	0.277	0.155
INTERCEPT	0.375	0.278	2.733	0.247
Overall R^2	0.152		0.023	

To test whether fund closing may generate higher inflows to the rest of the fund family, I estimate the following fixed effects panel regression using pre-closing and post-closing data from the fund families of closed funds:

$$\text{FOINFLOW}_{i,t} = \alpha + \beta_1 \cdot \text{FSIZE}_{i,t-1} + \beta_2 \cdot \text{FOINFLOW}_{i,t-1} + \beta_3 \cdot \text{CDUMMY}_{i,t-1} + u_i + \varepsilon_{i,t}$$

where FOINFLOW is *family objective-adjusted inflow*, which is calculated as asset-weighted average of the objective-adjusted fund inflows of all funds in the rest of the family of the closed fund; FSIZE is the log of total assets of all funds in the rest of the family; CDUMMY is set equal to one if fund closing occurs in the previous time period, and zero otherwise; and u_i is the family-specific fixed effect for the ith family and is constant through time. The panel regression method is used to account for the fact that the pre-closing and post-closing observations from the same family are not independent relative to each other in this panel data set. Models using quarterly and annual FOINFLOW are both estimated. $\text{FRETURN}_{i,t-1}$, which provides the asset-weighted average of the objective-adjusted fund returns of all funds in the rest of the family, is also considered but not included in the model because it is highly correlated to $\text{FOINFLOW}_{i,t-1}$.
** indicates statistical significance at the 5% confidence level.

the rest of the fund family, at least in the short run. These findings indicate that a fund family's fund closing decision is more likely to be motivated by spillover effects, which generate higher inflows to the rest of the family.

4. Conclusion

This paper examines why some mutual funds are closed to new investors, based on a new data set from 1992 to 2001 of all equity funds, bond funds, and funds investing in both equities and bonds. I focus on the closing of a fund instead of individual share classes to avoid possible double counting of fund closings.

The performance of a mutual fund may deteriorate when the fund exceeds its optimal size or when it experiences large influx of new capital, primarily due to the tremendous adverse price impacts of trading large blocks of stocks. Fund families claim that closing a fund serves to protect its good performance by making it immune from heavy inflows and preventing it from growing too big. I find that funds with better performance, larger size, and higher inflows are more likely to be closed, especially small company growth funds, which are the most vulnerable to the adverse price impacts. All these findings are consistent with the fund families' claims.

However, no evidence can be found to suggest that closing a fund is able to protect its good performance. Instead, I find some evidence that fund families' closing decisions are more likely to be motivated by spillover effects. Recent studies document the existence of spillover effects – a star fund with superior performance in a fund family may generate greater cash inflows not only to the star fund itself but to other funds in the family as well. By closing a fund, the fund family signals its superior performance and consequently brings investors' attention to other funds in the family. The closing strategy appears to generate higher inflows into other funds in the rest of the family, at least in the short run. Large fund families are more likely to pursue the closing strategy, because spillover effects will influence a greater number of funds. In addition, fund families systematically supplement closed funds with new ones, thereby increasing the number of funds that can benefit from the spillover effects.

This paper not only examines the determinants of fund closings, but also provides a unique opportunity to investigate the spillover effects from a new angle and to shed greater light on the motives of fund families in general.

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Appendix A. Excerpts from press releases of fund closings (Source: PR Newswire)

August 6, 1993 John Hancock Special Equities Fund

"The fund is closing to preserve the integrity of its management style," says Michael P. DiCarlo, fund manager for the last five and a half years. "It has grown steadily over the last several months and has now reached a critical size. Closing Special Equities will give me the freedom to continue investing in the types of stocks that have contributed to its performance."

August 2, 2000 INVESCO Small Company Growth Fund

"Our highest priority is to deliver superior investment management for our shareholders. Closing the Fund will allow our managers to continue to select what they believe are the best investment opportunities in the small-cap sector," said Mark H. Williamson, Chairman and CEO for INVESCO Funds Group. "Controlling asset size is important to the ongoing success of the fund because of the limited investment universe of stocks available in this asset class," Williamson continued.

January 9, 2002 Dreyfus Midcap Value Fund

"The rapid growth of the Dreyfus Midcap Value Fund reflects the fund's strong performance and accelerating cash inflows," said Stephen E. Canter, Dreyfus

chairman and chief executive officer. ''However, it is our responsibility to manage this fund in the best interest of our current shareholders. Closing the fund to new investors will ensure that the fund managers retain the agility to strategically move assets in and out of investment opportunities.''

June 28, 2002 Wasatch Ultra Growth Fund

The door to the Wasatch Ultra Growth Fund will close to new investors effective July 17, 2002. As with previous Wasatch Equity Fund closures, this move is undertaken to protect the interests of existing shareholders by controlling the Fund's asset level in an effort to prevent it from becoming a hindrance to performance.

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