Portfolio Pumping in Mutual Fund Families

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Abstract

I document portfolio pumping at the fund family level, a strategy that non-star fund managers buy stocks held by star funds in the family to inflate their performance at the quarter end. Families that heavily employ the strategy show strong evidence of inflated performance after 2002, when the SEC increased regulation on portfolio pumping at the fund level. Non-star fund managers pumping for star funds in the family receive 1.8% ($24 million) more inflows per quarter, conditional on the performance. Furthermore, pumping is concentrated in stocks that are buried deep down in the holdings of star funds.

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1 Introduction

Portfolio pumping, also known as painting the tape or leaning for the tape, is a market manipulative strategy, by which fund managers mark up their holdings at the end of the period by buying stocks they hold. The strategy can lead to inflated portfolio values and misleadingly high returns. Previous literature on portfolio pumping focuses on the individual fund managers, and the rationale for portfolio pumping is to boost compensation at calendar year end. Carhart, Kaniel, Musto, and Reed (2002) first document the inflated net asset values (NAVs) of the mutual fund indices, and find that the portfolio pumping strategy is employed by top performing managers. Ben-David, Franzoni, Landier, and Moussawi (2013) find a similar pattern in the hedge fund industry. Duong and Meschke (2015) find that portfolio pumping activity has drawn attention from media and regulators, and decreased substantially after the publication of Carhart et al. (2002).

Instead of studying portfolio pumping at individual fund level, this paper is the first to explore a new dimension of portfolio pumping at mutual fund family level. The paper finds that managers pump stocks held by star funds in the family in order to inflate their star fund performance, especially after 2002, when it became risky for star fund managers to pump portfolios themselves under the watch of the SEC (Burns (2001)). Star funds with high family level pumping activities show significant performance inflations at quarter ends after 2002. More importantly, the reversal is not driven by fund level pumping, where star fund managers pump stocks themselves, but comes from the pumping by non-star fund managers in the family. In fact, fund level pumping falls, while family level pumping rises after Carhart et al. (2002). The result suggests the possibility that mutual fund families find loopholes in the legal system, bypass regulators to inflate their star fund performance, and continue to manipulate the market. Furthermore, pumping managers benefit from substantial future inflows even within the fund family, which cannot be explained by fund or family characteristics, such as performance and spillover effect. This can be explained by the cross-subsidization in the family, where family managers redirect flows to the pumping managers to compensate for their pumping activity.

The rationale for fund families to engage in portfolio pumping at family level is as follows. Profits of a mutual fund family are determined by the total assets managed and the fees they charge for their funds. By pumping portfolios and inflating returns of the star funds, family managers benefit from not only the convex inflows to their star funds due to investors' performance chasing behavior (Sirri and Tufano (1998)), but also the spillover inflows to non-star funds in the family (Nanda, Wang, and Zheng (2004)). As a result, the family size grows. Furthermore, recent studies of mutual fund show that the compensation of a mutual fund manager depends on individual performance and family size. The family size plays a crucial role in determining compensation when the manager's performance is not in the top (Ma, Tang, and Gómez (2015), and Ibert, Kaniel, Van Nieuwerburgh, and Vestman (2017)). Therefore, non-star fund managers are willing to pump the star fund portfolios. Moreover, recent regulator attention makes it costly for managers to pump portfolios themselves, especially for star fund managers who have the most incentive to do so. Pumping at family level only requires non-star fund managers to execute the trade, while star funds benefit from the price impact. Therefore, pumping at family level is less likely to be detected by regulators.

First, this paper finds evidence of portfolio pumping at family level after 2002. Using mutual fund quarterly holdings, I construct two measures to capture the family level pumping activity and the individual fund level pumping activity, respectively. Before 2002, the more the individual fund level pumping activity, the larger the performance reversals at the turn of quarters, while there is no evidence of fund level pumping after 2002. Contrary to the evidence of fund level pumping, star funds with high family level pumping activity show significant performance inflations after 2002, while there is no evidence of family level pumping before 2002. The result suggests the possibility that mutual fund families shift pumping strategy from fund level to family level when the SEC increased its attention.

Second, this paper examines the incentive for non-star fund managers pumping star funds. I find that pumping managers enjoy more future inflows than non-pumping ones. In particular, non-star managers in the top quintile of pumping activity receive 1.8% ($24 million) more fund inflows in the next quarter than the ones in the bottom quintile, conditional on fund performance. The magnitude of the cross-subsidization is greater than the well-known spillover effect of 1.1%. Furthermore, within a fund family, pumping managers receive more inflows than non-pumping managers, after controlling for fund performance and spillover effect. More importantly, the monotonic relation between the family level pumping behavior and the fund future flow is only significant after 2002. The timing of such cross-subsidization in fund families is consistent with the increased family level pumping activity. Moreover, the result is different from the findings commonly seen in the window dressing literature, where window dressing managers buy winning stocks and sell losing stocks at the quarter end. Agarwal, Gay, and Ling (2014) show that window dressing managers do not enjoy future inflows. However, I find that managers who help pump star funds in the family get substantially more inflows in the next quarter.

Previous literature has shown that mutual fund family plays an important role in determining resource allocation among funds in the family. For example, Gaspar, Massa, and Matos (2006) show that star funds receive more hot IPOs than non-star funds. Guedj and Papastaikoudi (2003) find that better performing funds in the family have a higher probability of getting more managers. In this paper, I find that mutual fund family subsidizes pumping managers in the future with more inflows. One potential channel is that, family manager advertises pumping funds more than non-pumping funds, thus redirecting flows to pumping funds. Although investors make investment decisions, salesmen and financial advisors in the family can persuade investors to invest in pumping funds in order to compensate pumping manager's effort. Gallaher, Kaniel, and Starks (2015) document that fund family makes all the advertising decisions, and advertising expenditure has a significant positive effect on fund inflows. Another possible channel in which families can redirect flows to pumping funds is through fund of funds. Families can increase the holding of pumping funds in fund of funds, so that there are positive and substantial inflows to the pumping funds. This paper further studies where inflows to pumping funds come from, and finds that both institutional and retail inflows are positively correlated with managers' past pumping activity.

Third, I propose tests to identify funds and families that are active in family level pumping. I find that families with the highest level of daily return reversals at year-end in 2002 are the ones that heavily pump for their star funds after 2002. Expensive families with fewer star funds are more likely to engage in family level pumping. The result is consistent with Nanda et al. (2004) that families try hard to generate star funds. The evidence of portfolio pumping at family level is the strongest in the fourth quarter when fund families have the greatest incentives to do so. Furthermore, funds are more active in portfolio pumping at family level if they share at least one common manager with star funds. This is likely due to the fact that a common manager knows which stocks are the most effective to pump.

Last, I test and exclude alternative explanations for why pumping managers receive more inflows in the family. One possible explanation is that mutual fund managers buy stocks recommended by the research team. Therefore, in the data, we see non-star managers buy stocks held by star funds, and investors react to the holdings of recommended stocks. Another possible explanation is that non-star fund managers trade promising stocks with star fund managers (Gaspar et al. (2006)), or non-star managers herd with star funds. Moreover, pumping managers do not outperform in the future. More interestingly, pumping managers are compensated with more future inflows when they pump the stocks buried deep down in star funds within the family, and they do not receive any benefit when they pump stocks that are held by star funds outside the family.

The remainder of the paper is organized as follows. Section 2 reviews the current literature on portfolio pumping and strategies of mutual fund families. Section 3 discusses the data and the construction of key variables. Section 4 shows the empirical results, and Section 5 concludes.

2 Literature Review

2.1 Portfolio Pumping Literature

Current literature focuses on the portfolio pumping at individual fund level. Using equal-weighted fund indices and daily returns of funds, Carhart et al. (2002) find NAVs inflation at the last trading day of the quarter, and a reversal in the following trading day. The reversal is the greatest at the year (quarter) end for funds with the best performance of the year (quarter). Furthermore, the inflation is the greatest for stocks held by funds with the most incentive to inflate. The rationale for portfolio pumping is that managers try to boost compensation at calender year end. Gallagher, Gardner, and Swan (2009) find evidence of portfolio pumping of mutual funds in Australia, where active fund managers buy illiquid stocks on the last day of the quarter. Ben-David et al. (2013) find that some hedge funds pump their portfolios on critical reporting dates. Bhattacharyya and Nanda (2012) build a model, in which managers sacrifice long-term performance for short-term performance by pumping their portfolios, when compensation depends on long-term and short-term performance. Duong and Meschke (2015) find that the portfolio pumping phenomena decreases sharply after Carhart et al. (2002). The timing is consistent with more market anticipation, regulation attention, and media reports.

The paper investigates the possibility of portfolio pumping at family level. Most mutual funds belong to fund families, and family managers have the incentive to boost performance of their star funds. By constructing a series of family level portfolio pumping variables, this paper shows evidence that star funds with high family level pumping activity exhibit significant return inflations even after 2002 at the turn of quarters, when the SEC started to increase regulation on portfolio pumping. However, there is little evidence of the family level portfolio pumping before 2002, suggesting a possibility that families shift the pumping strategy from fund level to family level, so that they can continue to manipulate the market.

2.2 Fund Family Strategy Literature

Previous literature has studied the family affiliation and its effect. On the one hand, the family affiliation provides several advantages to mutual funds and investors. It could offer the economics of scale to individual funds in terms of research, IT support, office space, marketing and advertisement. Gallaher et al. (2015) show that advertisement expenditure has a convex effect on fund flows at family level. Jayaraman, Khorana, and Nelling (2002) find that there are significant improvements in performance and reduction in the expense ratio after the merger of two mutual funds. Meanwhile, investors can also benefit from the reduction of searching cost because of the brand reputation. Sirri and Tufano (1998) find that capital inflows to a fund are directly related to the size of the fund's complex and the level of media attention.

On the other hand, family affiliation could distort managers' incentives, and certain family strategies require sacrifices of some funds to benefit others. Gaspar et al. (2006) show that there exists performance transfer from low value funds to high value funds within a fund complex. In particular, high value funds obtain more hot IPOs than low value funds, and low value funds cross trade promising stocks to high value funds. Nanda et al. (2004) find that low skill families strategically create star funds in order to enjoy the spillover effects.

This paper studies a family level pumping strategy that sheds light on the dark side of the family affiliation. That is, non-star fund managers buy stocks held by the star funds in the family at quarter end, in order to inflate the performance of star funds. The pumping managers, in return, receive more inflows in the following quarter than non-pumping managers in the family. The strategy is related to the performance transfer through cross trading proposed in Gaspar et al. (2006), but is different from an important aspect. The family level portfolio pumping strategy requires non-star fund managers to buy stocks in the market to generate enough price impact on the star fund portfolios, whereas cross trading is a cost-efficient way to swap positions between funds and does not produce enough price impact.

3 Data and Variable Construction

3.1 Sample Selection

I use the Center for Research in Security Prices (CRSP) Mutual Fund database, Thomson Reuters Mutual Fund database, and MorningStar Direct to construct the data.

The CRSP Mutual Fund database provides the monthly fund return, fund total net assets (TNA), expense ratio, turnover ratio, management company, and fund age at the share class level, starting from December 1961. CRSP provides daily fund return starting from September 1998[1], and quarterly portfolio holdings starting from September 2003. Thomson Reuters Mutual Fund database provides quarterly and semiannual holdings starting in 1980. MorningStar Direct provides mutual fund overall rating from 1986.

Because CRSP provides fund data at the share class level with the unique identifier *crsp_fundno*, I use *crsp_portno* (available only after July 2003) from CRSP and *wficn* from MFLink as fund identifiers to aggregate different share classes. I value-weight different share classes by their previous month TNAs [2] to construct fund level returns, expense ratios, and turnover ratios. Portfolio holding data from CRSP and Thomson Reuters are at the fund level. I then merge the Thomson Reuters and CRSP using MFLink identifier *wficn*.

I also use MorningStar Direct (MS) mutual fund "Overall Rating" as an alternative indicator for star funds. MS overall rating assigns 1 to 5 stars based on a fund's historical risk and load-adjusted returns versus category peers. Since CRSP does not provide detailed portfolio manager names[3], I merge CRSP with MorningStar Direct to get star ratings and detailed manager histories[4].

[1] I use MorningStar Direct data to supplement fund daily returns from 1990 to 1998.

[2] Missing data in CRSP are coded as either -99 or missing. If the TNA for a share class of a previous month is missing or -99, I do not include it in the value-weighting. The fund level TNA is the sum of non missing TNAs of all its share classes.

[3] In CRSP, *mgr_name* only contains the last name of each portfolio manager. When the number of managers of a fund exceeds 3, it is usually coded as "Team Managed".

[4] I first merge CRSP with MorningStar Direct by fund *cusip* and *ticker*. For unsuccessful merge, I use a text-based merging algorithm by fund name and share class. I then verify the merge by fund returns and TNA.

Mutual fund families often open new funds with a limited amount of capital. At the end of an evaluation period, successful funds are opened to the public, while unsuccessful ones are shut down (see Evans (2010)). To account for the incubation bias, I exclude funds without a fund name in the CRSP database. I also exclude funds with TNA less than $5 million, or that hold fewer than 10 stocks. I use the first three letters of *crsp_obj_cd* in the CRSP database to define style dummies. I include only domestic equity funds that are actively managed. I exclude balanced, bond, international, money market, and sector funds.

3.2 Measuring the Portfolio Pumping inside the Family

To measure the portfolio pumping inside the family, I construct the following variables *Family Support* and $\textit{Holding Support}^{\textit{Net Purchase}}$. *Family Support* quantifies the potential price impact received by star funds in the family, as a result of family level pumping activity. $\textit{Holding Support}^{\textit{Net Purchase}}$ quantifies the participation level of a non-star fund manager pumping for star funds in the family.

3.2.1 Constructing ***Family Support***

To quantify the effect of portfolio pumping received by the star funds in the family, I construct the variable *Family Support*. All funds are sorted by their past-11-month performance into quintiles in each quarter. Funds that are in the top quintile[5] are coded as the star funds[6]. For family k and stock s at quarter t, I aggregate the portfolio holdings of all star funds, which is denoted as $\textit{Star Holding}_{k,s,t}$. For example, suppose that there are two star funds in family k at quarter t, each holding 100 shares of stock s. Then $\textit{Star Holding}_{k,s,t}$ is 200. I then compute the weight of stock s in the aggregated star portfolios, and denote it as

[5] The empirical result is robust if I use the top decile, or the MorningStar analyst rating to identify star funds.

[6] Note that by construction, some mutual fund families may not have any star funds, and are dropped in the analysis. However, all the empirical results, available upon request, do not qualitatively change, if I code the top-performing fund as a star fund in a family, in case the family does not have any funds sorted in the top quintile. By doing so, all funds will be included in the analysis.

$Star\ Weighting_{k,s,t}$,

$$Star\ Weighting_{k,s,t} = \frac{Star\ Holding_{k,s,t} \cdot P_{s,t}}{\sum_{l \in L_{k,t}} Star\ Holding_{k,l,t} \cdot P_{l,t}}, \tag{1}$$

where $P_{s,t}$ is the adjusted stock price of s at the end of quarter t, and $L_{k,t}$ is the set of stocks held by star funds in family k at quarter t.

For each family k and each stock s, I aggregate the number of shares purchased/sold by non-star fund managers in family k, normalize it by the trading volume of stock s, and denote it as $Net\ Shares\ Purchased_{k,s,t}$. Normalizing the number of shares purchased by the trading volume[7] is necessary, since the price impacts generated by the pumping from non-star funds depend on the liquidity of the stock. The potential benefit received by the star funds in the family, $Family\ Support_{k,t}$ is the sum of the products of $Net\ Shares\ Purchased_{k,s,t}$ and $Star\ Weighting_{k,s,t}$.

$$Net\ Shares\ Purchased_{k,s,t} = \sum_{i \in I_{k,t}} \frac{Holding_{i,k,s,t} - Holding_{i,k,s,t-1}}{Vol_{s,t}}, \tag{2}$$

$$Family\ Support_{k,t} = \sum_{s} Net\ Shares\ Purchased_{k,s,t} \cdot Star\ Weighting_{k,s,t}, \tag{3}$$

where $I_{k,t}$ is the set of non-star funds of family k at quarter t, and $Vol_{s,t}$ is the trading volume of stock s at quarter t.

3.2.2 Constructing *Holding Support*$^{Net\ Purchase}$

For each non-star fund i in family k at quarter t, I calculate the net purchase of each stock s, normalized by the total portfolio holding value of fund i at quarter t,

$$Net\ Purchase_{i,k,s,t} = P_{s,t} \cdot \frac{Holding_{i,k,s,t} - Holding_{i,k,s,t-1}}{\sum_{l \in L_{i,t}} P_{l,t} \cdot Holding_{i,k,l,t}}, \tag{4}$$

[7]Normalizing the net shares purchased by the last day trading volume or the total shares outstanding does not qualitatively change the result.

where $Holding_{i,k,s,t}$ is the number of shares of stock s held by fund i in quarter t, and $L_{i,t}$ is the set of stocks held by fund i in quarter t. The normalization by portfolio value is necessary, because I control for the fund size in the empirical analysis. Moreover, I choose stock prices at the end of each quarter. This is the most relevant timing, since the performance of the fund is typically evaluated at the end of the quarter. I also test using prices at the beginning of the quarter as well as in the middle of the quarter. The result does not qualitatively change.

$Holding\ Support^{Net\ Purchase}_{i,k,t}$ is the weighted summation of *Net Purchase*,

$$Holding\ Support^{Net\ Purchase}_{i,k,t} = \sum_s Star\ Weighting_{k,s,t} \cdot Net\ Purchase_{i,k,s,t} \tag{5}$$

By construction, $Holding\ Support^{Net\ Purchase}$ increases as non-star fund managers buy stocks held by the star funds, and it increases if the stocks constitute a large portion of star funds in the family.

3.3 Other Key Variables

Fund Expense and *Fund Turnover* are the fund level annual expense ratio and turnover ratio from CRSP, respectively. *Fund TNA* is the fund level total asset managed at the quarter end. Following the previous literature, I construct two measures for fund flows: dollar flow (*$ flow*) and percent flow (*% flow*)[8].

$$\$\ flow_t = TNA_t - TNA_{t-1} \cdot (1 + r_t) \tag{6}$$

$$\%\ flow_t = [TNA_t - TNA_{t-1} \cdot (1 + r_t)]/TNA_{t-1} \tag{7}$$

CRSP provides daily and monthly return data at the share class level since September 1998. I aggregate returns using their previous month TNA as weight, and then estimate

[8] I also use the construction $\%\ flow_t = [TNA_t - TNA_{t-1} \cdot (1 + r_t)]/[(1 + r_t)TNA_{t-1}]$, and results do not qualitatively change.

fund's daily and monthly alpha based on the four-factor model of Carhart (1997). I use a 24-month rolling window to estimate monthly net and raw alpha, and a 252-day rolling window to estimate daily alpha and then aggregate daily alpha to the monthly level. Next, I aggregate monthly alpha to get 2-month, quarterly, 11-month, and 12-month alpha. In the main result, I only use monthly net alpha as my main alpha measure. However, the result does not qualitatively change when I switch the alpha measure to either monthly raw alpha or daily alpha.

Manager skill is the 12-month moving average of the return gap defined in Kacperczyk, Sialm, and Zheng (2008), which is the difference between the real return and the return of a hypothetical portfolio with last-reported holdings that are assumed to have been held throughout the quarter. Kacperczyk et al. (2008) find that *Manager skill* is positively correlated with future fund returns, and it is also used as a control in Agarwal et al. (2014).

Fund Age is the number of years between the fund inception date provided by the CRSP and the observation date.

$\textit{Winner Prop}_{i,t}$ is the proportion of winner stocks held by fund i at quarter t. $\textit{Loser Prop}_{i,t}$ is the proportion of loser stocks held by fund i at quarter t. Winner (loser) stocks are the top (bottom) quintile stocks sorted by the past quarter performance.

Common Manager is a dummy variable, which is equal to one if the fund shares at least one common manager with the star funds in the fund family.

To identify mutual fund families, I use *mgmt_cd*, which is a three-letter management company identifier from CRSP. In those cases where *mgmt_cd* of the fund i is missing at time t, if the management company name $\textit{mgmt\_name}_{i,t}$ is not missing and there is some fund j at time t with the same management company name and non-missing *mgmt_cd*, I replace $\textit{mgmt\_cd}_{i,t}$ with $\textit{mgmt\_cd}_{j,t}$. If both $\textit{mgmt\_name}_{i,t}$ and $\textit{mgmt\_cd}_{i,t}$ are missing, I use the first couple of words in the fund name to identify the fund family and fill missing values manually.

Table 1 and Table 2 show the summary statistics and the correlation matrix of key variables.

4 Empirical Results

4.1 Convex Fund Flow and Spillover Effect

Table 3 studies the convexity of funds' flows and the spillover effect. Funds are sorted by their alphas at quarter t into quintiles. Fund i is categorized as a $\textit{Top Fund}_{i,t}$ if it is in the top performance quintile at quarter t. Fund i is categorized as a $\textit{Mid Fund}_{i,t}$ if it is neither in the top nor in the bottom performance quintile at quarter t. Fund i belongs to a $\textit{Star Family}_{i,t}$ if at least one other fund in fund i's family is in the top performance quintile. $\textit{Star Alpha}_{i,t}$ is the quarterly alpha of the top performing fund other than fund i itself in the family. $\textit{Fund Size}_{i,t}$ is the log transformation of fund i's TNA at quarter t. $\textit{Family Size}_{i,t}$ is the log transformation of the total TNA of fund i's family (the TNA of fund i is not included).

Columns (1) and (3) of Table 3 replicate the flow analysis of Agarwal et al. (2014). The next quarter fund inflow is positively correlated with the fund's current quarter performance and manager skills, and negatively correlated with the fund expense ratio and the fund size. Meanwhile, investors pay attention to the fund holdings at the end of the quarter. Specifically, investors award funds which hold more winner stocks and fewer loser stocks at the quarter end, controlling for the performance of funds.

Column (2) introduces the quadratic term of fund performance, $\textit{Carhart Alpha}^2$. Similar to the findings of Sirri and Tufano (1998), there is a convex relation between flows and past performance. In Figure 1, I sort funds into deciles by their past year performance and plot their mean percent inflows. As shown in the figure, the convexity relation between the performance and the future inflows applies mostly to the very top funds, whereas the relation is linear for the middle and the bottom funds.

Columns (4) and (5) add family characteristics and report the spillover effect of the star funds. The coefficient estimates of $\textit{Star Family}_{i,t}$ are positive and highly significant. Being in a star family increases a fund's next quarter percent flow by 1.1%. Meanwhile, the coefficient estimate of $\textit{Star Alpha}_{i,t}$ is positive and significant. The future inflows are higher if the performance of the star funds in the fund family is higher, which is known as the spillover effect. The spillover effect is also documented in Nanda et al. (2004), Ivkovich (2001), and Khorana and Servaes (1999).

4.2 Portfolio Pumping at Family Level

Carhart et al. (2002) document portfolio pumping of mutual funds and find that star fund managers are doing so to boost their compensation at quarter end. Duong and Meschke (2015) show that performance inflation decreases sharply after 2002 when the SEC started to focus on portfolio pumping. This section tests a possible pumping strategy at fund family level, where non-star fund managers buy and pump stocks held by star funds in the family. As the SEC increases its regulation on portfolio pumping after 2002, it becomes riskier for star fund managers to pump their portfolios. The strategy of family level pumping only requires the non-star fund managers to execute the trade, but achieves a similar price impact on star fund portfolios. By taking a detour to manipulate the market, families that adopt the strategy are less likely to be detected by regulators. From the perspective of family managers, the strategy is rational because investors reward superior performance of the star funds with convex inflows, which increases the family size and total fees they can charge (see Section 4.1). Moreover, non-star funds in the family benefit from the spillover effect because of the superior performance of their star funds. Such portfolio pumping at family level has not been tested in the previous literature.

Section 4.2.1 shows that star funds with high family level pumping activity exhibit significant performance inflation after 2002. Section 4.2.2 shows that the performance inflation after 2002 is only from pumping at family level, but not from individual fund level, where star fund managers pump portfolios for themselves.

4.2.1 Performance Inflation of Mutual Fund Families

This section tests the performance inflation of star funds in mutual fund families. A fund is coded as a star fund in a calendar year if its cumulative net alpha from the beginning of January to the end of November in the given year is ranked in the top quintile[9]. All star funds are sorted by the proxy of family level pumping, *Family Support*, into deciles.

To address the concern of cross-sectional correlation among star funds, I construct 10 equal-weighted indexes of star funds based on the decile of *Family Support*. After 2002, each index has 3,021 observations. For each index, I then run the following regression (8) to capture the inflation at the turn of quarters, and plot the 95% confidence interval of b_1 and b_2 in Figure 2. I also construct a long/short portfolio where I buy funds in the top decile and sell funds in the rest of the deciles, and run the regression to see the difference in returns at the turn of quarters.

$$R_t = b_0 + b_1(YEND_t + QEND_t) + b_2(YBEG_t + QBEG_t) + b_3 MEND_t + b_4 MBEG_t + \epsilon_t \quad (8)$$

The dependent variable is the excess return of the market. The independent variables are a set of time dummies. $YEND_t$ is 1 if it is the last trading day of December. $YBEG_t$ is 1 if $YEND_{t-1}$ is 1. $QEND_t$ is 1 if it is the last trading day of March, June, or September, and $QBEG_t$ is 1 if $QEND_{t-1}$ is 1. $MEND$ is 1 if it is the last trading day of January, February, April, May, July, August, October, or November. $MBEG_t$ is 1 if $MEND_{t-1}$ is 1.

As shown in Figure 2, only star funds in the top deciles of *Family Support* show significant reversals at the turn of quarters after 2002. In the pre-2002 sample, all ten indexes show performance inflation, and the magnitude of the inflation does not depend on the level of *Family Support*. Before 2002 when there is little attention to pumping, mutual fund families do not need to employ family level pumping strategy to inflate star fund performance, as star fund managers can simply pump portfolio themselves. After Carhart et al. (2002), star fund

[9] The selection of 11-month evaluation period instead of the full year is to avoid the look-ahead bias resulted from the pumping behavior.

managers become the primary target to the SEC, as they have the most incentive to boost performance. Pumping at fund level becomes risky, and only star funds with high family level pumping activity show significant performance inflation. Pumping at family level only requires non-star managers to execute the trade, while star funds enjoy the pumping. More importantly, the strategy is discreet and less likely to be detected by regulators.

Table 4 tests the performance reversal in the long/short portfolio. Similar to the setting in Figure 2, I construct the long/short portfolio by buying funds in the top decile of *Family Support* and selling funds in the rest of the deciles. Following Carhart et al. (2002), I run the following regression to see the reversals at the turn of year, quarters and months.

$$R_t = b_0 + b_1 YEND_t + b_2 YBEG_t + b_3 QEND_t + b_4 QBEG_t + b_5 MEND_t + b_6 MBEG_t + \epsilon_t, \quad (9)$$

In the sample after 2002, when the SEC increases its monitor on portfolio pumping, star funds with high family level pumping activity outperform the rest of the star funds by 6 basis points, 5 basis points, and 2 basis points at year, quarter, and month end, respectively. Meanwhile, they underperform the rest by 6 basis points, 4 basis points and 3 basis points at year, quarter, and month beginning, respectively. There is no significant performance difference on days other than turn of periods, as the constant term is insignificantly different from zero. In the sample before 2002, there is no reversals in performance at the turn of periods.

Table 5 shows the timing of family level pumping in a panel regression setting. The sample includes 10 indexes of portfolios based on *Family Support* deciles. I regress the daily excess return of these indexes on a set of dummy variables and their interaction terms with *High Support* dummy, which is equal to one if it is the top decile. If fund families started to pump star funds at family level after 2002, we should expect significantly positive coefficient estimates of interaction terms *High Support* $\times$ *YEND* and *High Support* $\times$ *QEND*, and significantly negative coefficient estimates of *High Support* $\times$ *YBEG* and *High Support* $\times$

QBEG in the post-2002 sample. Moreover, such pattern should not exist or be much weaker in the pre-2002 sample. Columns (1) and (2) of Table 5 show the result in the pre-2002 and post-2002 samples, respectively. After 2002, families with a high level of family level pumping activities exhibit significantly higher excess returns at the end of periods, and lower excess returns at the beginning of periods than the rest of the families. Such pattern of reversal for *High Support* families does not exist before 2002.

4.2.2 Family Pumping or Individual Pumping

The previous section shows that funds with high family level pumping activity show significant performance inflation even after 2002, when the SEC increases its regulatory pressure on portfolio pumping. However, it is unclear whether the family level pumping is the solely driving force of the performance inflation, or star fund managers also pump portfolios for themselves.

To better isolate family pumping from individual pumping, I construct the measure *Self Support*. The construction is very similar to *Family Support*, except that it captures the net purchase made by the star funds instead of the non-star funds.

$$Self\ Support_{k,t} = \sum_{s} Star\ Net\ Shares\ Purchased_{k,s,t} \cdot Star\ Weighting_{k,s,t} \tag{10}$$

I then sort the same set of star funds by *Self Support* into deciles, and construct 10 equal-weighted indexes of portfolios. Similar to the construction of Figure 2, I regress the daily excess return of each index on the time dummies, and plot the turn of quarter coefficient estimates and their confidence intervals in Figure 3.

Figure 3 (a) shows the performance reversals before 2002. Performance inflation increases as we move from the bottom to the top decile of *Self Support*. The finding alleviates some concerns of the pumping measures used in the paper. Even though the pumping measures are constructed using quarterly holding data, they are still able to capture the performance inflation. After 2002, as shown in Figure 3 (b), there is no significant reversal patterns when we sort funds by *Self Support*. In other words, the reversal pattern we see in Figure 2(b) are driven by family level pumping activity, not by individual fund level pumping.

In summary, the decrease of portfolio pumping at individual fund level is consistent with the closer attention by regulators and the media. While fund level pumping falls, family level pumping rises in response to the increased regulator attention. As a result, we observe that families that employ the strategy of family level pumping still show significant performance inflations at the turn of quarters even after 2002.

4.3 Do Fund Managers Benefit from Portfolio Pumping?

In this section, I investigate whether non-star fund managers benefit from pumping portfolios of star funds in the family.

In Panel A of Table 6, non-star funds are double sorted by past-year aggregated alpha and current quarter *Holding Support*$^{Net\ Purchase}$ into 5×5 quintiles, and the mean of the next quarter inflows in each quintile is calculated. For each performance quintile, the mean of the next quarter inflows strictly increases with *Holding Support*$^{Net\ Purchase}$. That is, non-star fund managers are compensated with future inflows when they buy stocks held by the star funds in their family at the end of the quarter. The result suggests that non-star fund managers who pump the portfolio of star funds enjoy the spillover effect.

However, the finding in Panel A of Table 6 could also be explained if funds with high *Holding Support* are more likely to have more star funds, so that the spillover effect is stronger. Therefore, I calculate the proportion of the total asset managed by star funds, *Star_Portion*, in each family. I then double sort funds by *Star_Portion* and *Holding Support*$^{Net\ Purchase}$, and report the mean inflows in each quintile in Panel B. Similar to the result in Panel A, the mean inflow strictly increases with *Holding Support*$^{Net\ Purchase}$ in each *Star_Portion* quintile. That is, controlling for the star chasing behavior of investors, fund managers are compensated more with future inflows when they pump the portfolio of star funds in the family.

Nanda et al. (2004) study the spillover effect that a fund's inflow is positively correlated with the performance of the star fund in the mutual fund family. In Panel A of Table 6, the average difference in future inflows between the top and the bottom quintiles of $\textit{Holding Support}^{\textit{Net Purchase}}$ is about 1.8% per quarter, whereas the spillover effect estimated in column (4) of Table 3 is 1.15%.

The result is also different from the one in window dressing literature, where fund managers buy winning stocks and sell losing stocks at the end of the quarter. Agarwal et al. (2014) show that window dressing managers do not attract more future inflows, conditional on fund performance. In this paper, managers who pump for star funds in the family enjoy substantial inflows in the next quarter.

4.3.1 Investors' Attention or Redirections of Flows

In this section, I test whether the monotonic relation between $\textit{Holding Support}^{\textit{Net Purchase}}$ and future inflow found in Table 6 is driven by investors' attention to holdings of star portfolios, or that the fund family redirects some of the flows to managers who pump for star funds.

I assume that investors have limited attention to portfolio holdings. That is, they pay more attention to top holdings than non-top holdings. Mutual funds typically disclose their ten largest holdings on their website at the end of the month. As shown in Figure A1, Vanguard U.S. Growth Fund discloses its top ten portfolio holdings at the end of August, 2016.

To test whether the monotonic relation between the $\textit{Holding Support}^{\textit{Net Purchase}}$ and the future inflow is driven by investors' attention to star portfolios, I decompose the measure of $\textit{Holding Support}^{\textit{Net Purchase}}$ into two parts, $\textit{Holding Support}^{\textit{Visible Net Purchase}}$ and $\textit{Holding Support}^{\textit{Invisible Net Purchase}}$.

$$Holding\ Support^{Visible\ Net\ Purchase}_{i,k,t} = \sum_s Top_{k,s,t} \cdot Star\ Weighting_{k,s,t} \cdot Net\ Purchase_{i,k,s,t} \tag{11}$$

$$Holding\ Support^{Invisible\ Net\ Purchase}_{i,k,t} = \sum_s (1 - Top_{k,s,t}) \cdot Star\ Weighting_{k,s,t} \cdot Net\ Purchase_{i,k,s,t} \tag{12}$$

where *Star Weighting* and *Net Purchase* are defined in Equation (5). $Top_{k,s,t}$ is equal to one if stock s is among the top ten largest holdings of star funds in family k at the end of quarter t, and zero otherwise. The implicit assumption I make to construct these measures is that the net purchase of a stock made by non-star fund managers draws investors' attention only if the stock is in the top ten holding lists of the family star funds. I then double sort funds by $Holding\ Support^{Visible\ Net\ Purchase}$ ($Holding\ Support^{Invisible\ Net\ Purchase}$) and past year performance into 5×5 quintiles, and calculate the mean of next quarter fund inflows in each quintile. Table 7 reports the result.

Both panels of Table 7 show that visible and invisible pumping are correlated with future inflows, conditional on the performance. The magnitude of future inflows is larger when non-star fund managers pump stocks deep in star funds.

4.3.2 Flow Subsidization for Pumping Managers: Evidence from Multiple Regressions

In this section, I test the findings of the previous tables using the multiple regression approach. I run the following regression,

$$\%\ Flow_{i,t+1} = \alpha + \beta' Holding\ Support_{i,t} + \gamma' \mathbf{X}_{i,t} + \epsilon_{i,t}, \tag{13}$$

where the dependent variable *% Flow*$_{i,t+1}$ is the next quarter inflow of the fund i, and $\mathbf{X}_{i,t}$ is a vector of fund and family characteristics used in Table 3.

The whole sample result is shown in Table 8. In columns (1) to (3), the coefficient estimates of various *Holding Support* measures are all positive and significant (except in column (2)), consistent with the results shown in Table 6 and Table 7. In column (4), I conduct a horse-race between the visible and invisible *Holding Support*, and only the coefficient estimate of invisible *Holding Support* is positive and significant. The result strengthens the finding that the monotonic relation between *Holding Support* and future fund inflows cannot be explained by investors' attention to the top holdings of the star funds.

I then split the whole sample into two subsamples, before and after 2002. Since portfolio pumping at family level emerges as a workaround to regulators' increased attention on fund level portfolio pumping and stock manipulation, we should expect that non-star fund managers benefit from family level pumping only after 2002. Table 9 shows the result. Columns (1) to (4) report the result of the subsample before 2002, and columns (5) to (8) report the result of the subsample after 2002. None of the coefficient estimates of *Holding Support* are significant in columns (1) to (4), whereas the coefficient estimates are more significant for the subsample after 2002. The result is consistent with the whole sample analysis, and suggests that the finding in Table 8 is purely driven by the post-2002 subsample.

Furthermore, the monotonic relation between *Holding Support* and next quarter inflow is not driven by fund and family characteristics, such as performance and spillover effect, as I include fund performance, star fund performance, next quarter inflow of star funds, and family fixed effect. The result suggests that, within a fund family, managers who pump more for the star funds receive more inflows in the next quarter, on top of their performance and spillover effect from star funds.

The flow subsidization for pumping managers can be explained by the redirection of flows inside a fund family. Mutual fund family makes decisions for resource allocations and advertisement. One potential channel is that mutual fund family advertises pumping funds more in the future to compensate managers' pumping effort. If this is the case, we should expect that inflows mainly come from retail investors. Gallaher et al. (2015) find that funds that are advertised by the family receive more inflows. Another channel is through fund of funds, where the family can increase the holding of pumping funds in its fund of funds. The effect will be mostly concentrated in institutional investors.

To test where the flow comes from, I split inflows of funds into two parts, retail and institutional flows, according to share class code from CRSP. On the one hand, if it is the advertising channel that drives the result, we should expect that pumping managers are compensated with retail investors. As previous literature shows, retail investors are more likely to be redirected than institutional ones. On the other hand, if the result is driven by the fund of funds channel, we should expect the institutional inflows are correlated with pumping effort. I use the next quarter retail (institutional) flow as dependent variable, and run similar regression in Equation (13). Table 10 shows the result. Interestingly, in the post-2002 sample, the benefit of pumping star funds comes not only from retail inflows, but also from institutional inflows. Therefore, both advertising channel and fund of funds channel remain possible.

4.4 Portfolio Pumping Pattern inside Fund Families

4.4.1 Evidence at Fund Level

I study the determinants of portfolio pumping inside the fund families in Table 11. The dependent variable is $\textit{Holding Support}^{\textit{Net Purchase}}$.

Common Manager is a dummy variable which is equal to one if the fund shares at least one common manager with the star funds, and zero otherwise. *Fourth Quarter* is a dummy variable which is equal to one if the date of observation is in the fourth quarter of the calendar year, and zero otherwise. *Outsourced* is a dummy variable, which is equal to one if the fund is outsourced. *Inst Share* is the proportion of TNAs in institutional share classes of a fund.

Column (1) of Table 11 shows the result of the baseline specification. The coefficient estimate of fund performance (*Carhart Alpha*) is insignificant. The coefficient estimates of *Outsourced* and *Inst Share* are significant and negative. The result of the baseline specification suggests that portfolio pumping at family level is not correlated with the manager's performance, and pumping managers are more likely to be in an in-house fund with less governance from institutional investors.

Column (2) of Table 11 adds the dummy variable *Common Manager* to the baseline specification. The coefficient estimate of *Common Manager* is positive and significant, and the economic magnitude is also significant. If a fund shares a common manager with the star funds in the family, it could move $\textit{Holding Support}^{\textit{Net Purchase}}$ from 25th percentile to 75th percentile. Column (3) of Table 11 adds the dummy variable *Fourth Quarter* and its interaction term with *Common Manager*. Both coefficient estimates are positive and significant. The result is also consistent with the previous finding that the portfolio pumping activity is more pronounced at the end of the year (Table 4).

Table 12 shows the subsample analysis result. For the subsample before 2002, the coefficient estimates of *Fourth Quarter* and the interaction term *Fourth Quarter*×*Common Manager* are not significant. The insignificance at the end of the year in the pre-2002 subsample is consistent with the lack of incentives to engage in portfolio pumping at family level when star fund managers can pump portfolios themselves before 2002. Moreover, the coefficient estimates of *Outsourced* and *Inst Share* are no longer significant in the post-2002 sample, suggesting that pumping at family level becomes more common and it is not concentrated in less governed funds anymore.

4.4.2 Evidence at Family Level

This section examines the characteristics of pumping activity at the fund family level, and is organized into two parts. The first part examines whether families with the highest level of performance inflation in 2002 are the ones that later employ the family level pumping strategy. The second part studies the characteristics of fund families that employ the strategy using a logit regression.

To test whether the heavily pumped mutual fund families before 2002 are the ones that employ family level pumping strategy, I first sort fund families by their star funds' return reversal at the end of 2002 into terciles. That is, the reversal is defined as the return difference of star funds in the last trading day of 2002 and the first trading day of 2003. Therefore, families in the top tercile are the ones that pumped the most in 2002. Second, I calculate the mean of *Family Support* for families in each tercile and for each year after 2002. The result is shown in Table 13. Families in the top tercile have higher *Family Support* in all years, except in year 2003, 2007, and 2008. Families with the highest level of return reversals are indeed the ones that are most likely to keep manipulating the market by employing the family level pumping strategy.

The second part of the section studies the characteristics of families that employ the family level pumping strategy. Fund families are sorted by *Family Support* into deciles in each quarter, and *High Support* is a dummy variable which equals one if the family is in the top decile in the given quarter. I then run a logit regression of *High Support* on several variables aggregated at the fund family level.

Table 14 reports the result. The family level portfolio pumping is not correlated with the family level performance, either in the short term such as the current quarter, or in the long term such as the past three quarters. Only *Family Alpha* is weakly significant in the whole sample result, but insignificant in subsamples. The result is consistent with Table 11 and Table 12, where the pumping activity is not driven by poor performance. The coefficient estimates of *Family Size* in all columns are positive and significant. This is not surprising, since large families are less constrained and more capable to make large transactions than small ones.

The coefficient estimates of *Family Expense* are positive and significant in the whole sample and the post-2002 sample, but insignificant in the pre-2002 sample. Expensive fund families have more incentive to pump the portfolio of the star funds, so that they get more fees from the increased assets under management. The insignificance of *Family Expense* in the pre-2002 sample strengthens the result that family level portfolio pumping serves as a workaround after 2002.

Star Portion is negative and significant for the whole and post-2002 sample. That is, fund families with fewer star funds are more likely to engage in the portfolio pumping at family level. The result is consistent with the family strategy literature, where fund families with fewer star funds benefit from the star creation strategy and enjoy the spillover effect.

4.5 Alternative Explanations

In this section, I study alternative explanations for why pumping managers attract future inflows. For each alternative explanation, I construct a measure, and run the regression (13) by replacing $\textit{Holding Support}^{\textit{Net Purchase}}$ with the new measure. The result is reported in Table 15.

Research recommendation

The research team is often shared by multiple funds within a fund complex. If the same recommendation is provided to both a non-star and a star fund, the construction of $\textit{Holding Support}^{\textit{Net Purchase}}$ no longer solely captures the family level pumping activity, but also captures the effect of the same recommendations within the fund family. Therefore, the monotonic relation between future inflows and $\textit{Holding Support}^{\textit{Net Purchase}}$ could be explained by either investors' attention to the recommended stocks, or superior performance of the recommended stocks. To test whether the previous result is driven by the same recommendations of the research team, I construct the alternative variable, $\textit{Holding Support}^{\textit{Lag Net Purchase}}$.

Similar to the construction of $\textit{Holding Support}^{\textit{Net Purchase}}$, I first construct $\textit{Star Weighting}_{k,s,t}$ and $\textit{Net Purchase}_{i,k,s,t}$, following Equations (1) and (4). However, instead of using the current quarter stock weighting in star funds, I use *Star Weighting* of the previous quarter to construct $\textit{Holding Support}^{Lag\ Net\ Purchase}$.

$$\textit{Holding Support}_{i,k,t}^{Lag\ Net\ Purchase} = \sum_{s} \textit{Star Weighting}_{k,s,t-1} \cdot \textit{Net Purchase}_{i,k,s,t} \tag{14}$$

The construction of $\textit{Holding Support}_{i,k,t}^{Lag\ Net\ Purchase}$ is no longer subject to the concern of the same recommendations in the family, because the stocks pumped by non-star funds are held by star funds at the previous quarter end. Therefore, $\textit{Holding Support}_{i,k,t}^{Lag\ Net\ Purchase}$ should have no effect on the fund future flow, if the previous result is driven by the same recommendations.

Column (1) of Table 15 shows the result. The coefficient estimate of $\textit{Holding Support}^{Lag\ Net\ Purchase}$ is positive and significant at 1% level. Therefore, the result that pumping managers get more future inflows is not driven by the same recommendation explanation.

Cross trading and herding

Alternatively, the result can be driven by either cross trading between star and non-star funds (see Gaspar et al. (2006)), or non-star fund copycatting informed trades of star funds.

On the one hand, Gaspar et al. (2006) find that there is performance transfer from "low value funds" to "high value funds" through hot IPOs and cross trades. They find that low value funds cross trade promising stocks to high value funds, and such cross trade can explain the abnormal superior performance of high value funds. The result in this paper is unlikely driven by the cross trading hypothesis. Although cross trading is usually cheaper within a mutual fund family, it does not generate price impact to the stock market. Without the price impact, we should not observe performance inflation of star funds at the turn of quarters.

On the other hand, non-star fund managers can possibly observe and copycat trades made by star fund managers. Investors pay attention to stocks held by the star fund, and they perceive a non-star fund as a good fund if two funds have similar portfolio holdings. Therefore, flows are likely to be greater to a non-star fund, which herd the star fund.

To test whether the monotonic relation between future inflows and $Holding\ Support^{Net\ Purchase}$ is driven by the co-movement[10], I construct the measure $Holding\ Support^{Cross\ Trades}$. I first calculate the normalized net purchase of stock s for both non-star fund i and star funds, respectively. Then I take the product of these net purchase for each stock, and sum over all possible stocks,

$$Holding\ Support^{Cross\ Trade}_{i,k,t} = \sum_{s} Star\ Net\ Purchase_{k,s,t} \cdot Net\ Purchase_{i,k,s,t} \tag{15}$$

On the one hand, if non-star fund managers cross trades with the star fund managers, and fund family compensates non-star fund managers for cross trading, then the coefficient estimates of $Holding\ Support^{Cross\ Trade}$ should be negatively correlated with future inflows. On the other hand, if non-star fund managers get more future inflows because of herding, the coefficient estimates of $Holding\ Support^{Cross\ Trade}$ should be positively correlated with future inflows.

In column (2) of Table 15, the coefficient estimate of $Holding\ Support^{Cross\ Trade}$ is insignificantly different from zero with a t-stat of -1.18. Therefore, the result is not driven by either cross trading within fund family or herding.

Are managers compensated for pumping stocks held by other families?

Managers of the fund family need to pump stocks carefully, so that the price impacts resulting from the pumping only benefit the star funds of their family, but not star funds outside the family. Therefore, I construct the variable $Holding\ Support^{Outside\ the\ Family}$ to test the hypothesis.

For each family k at time t, I first aggregate the holdings of all star funds outside of the family k, and calculate the stock weight in the aggregated portfolio. Second, I calculate the $Net\ Purchase_{i,k,s,t}$ of each stock s for each non-star fund i in family k, following Equation

[10] If a non-star fund manager cross trades with a star fund manager, their trades have opposite directions. If a non-star fund manager herds a star fund manager, their trades have the same direction.

(4). Third, I calculate *Holding Support*$^{Outside\ the\ Family}$ as the sum of the products over all stocks between *Net Purchase*$_{i,k,s,t}$ and the stock weight in the aggregated portfolio.

In column (4) of Table 15, the coefficient estimate of *Holding Support*$^{Outside\ the\ Family}$ is insignificantly different from zero, which is consistent with the pumping incentive of fund complex manager. Pumping managers are compensated with future inflows only when they pump stocks held by star funds in the family.

Do pumping managers outperform?

Another alternative explanation for the monotonic relation between pumping and future inflow is that non-star fund managers who buy stocks held by star funds also outperform in the future. The outperformance of these pumping managers leads to more inflows.

In Panel A of Table 16, non-star funds are double sorted by past-year aggregated alpha and current quarter *Holding Support*$^{Net\ Purchase}$ into 5×5 quintiles, and the mean of the next quarter alpha in each quintile is calculated and reported in percentage. Conditional on the past performance quintile, the result suggests that managers who engage in the high level of portfolio pumping for the family do not outperform managers in the low level[11]. In Panels B and C, I sort funds by replacing *Holding Support*$^{Net\ Purchase}$ with *Holding Support*$^{Invisible\ Net\ Purchase}$ and *Holding Support*$^{Lag\ Net\ Purchase}$, respectively. The results in Panels B and C are similar to the result in Panel A.

4.6 What Stocks do They Pump?

In this section, I study the characteristics of the stocks that fund families choose to pump. I construct quintile portfolios based on the net purchase of all non-star funds in all fund families. For each stock s and each fund family k, I calculate the dollar amount of the net

[11] Except for the lowest quintile, where managers in the top quintile of pumping outperform managers in the bottom quintile by 28.5 basis points per quarter.

purchase,

$$\textit{Dollar Net Purchase}_{k,s,t} = P_{s,t} \sum_{i \in I_{k,t}} (\textit{Holding}_{i,k,s,t} - \textit{Holding}_{i,k,s,t-1}),$$

where the set $I_{k,t}$ contains all non-star funds in family k at quarter t. I then aggregate the net purchase to the stock level,

$$\textit{Weighted Net Purchase}_{s,t} = \sum_{k} (\textit{Dollar Net Purchase}_{k,s,t} \cdot \textit{Star Weighting}_{k,s,t}).$$

Stocks are sorted by $\textit{Weighted Net Purchase}_{s,t}$ into quintiles at the end of each quarter t, and are held throughout quarter $t+1$ with equal weighting. Portfolio excess returns are regressed on Carhart (1997) four factors.

Results are reported in Table 17. The top quintile portfolio loads positively and significantly on the SMB factor. The result suggests that fund families choose to buy small stocks to pump the portfolios of their star funds. The finding is also consistent with the fact that small and illiquid stocks are subject to higher price pressure, and are easier to manipulate at the quarter end.

5 Conclusion

The paper contributes to the portfolio pumping literature. Previous literature studies portfolio pumping at individual fund level. This paper is the first to investigate portfolio pumping at family level. Under the supervision of the SEC, performance inflation at the turn of quarters has decreased sharply since 2002. However, fund family managers still have the incentive to pump the portfolio of their top funds. Specifically, non-star fund managers buy stocks held by the star funds in the family to pump their portfolios. The strategy can achieve a similar price impact on stocks held by star funds at quarter end as before, but is more discrete and less likely to be detected by regulators. Star funds in families that heavily employ such trading strategy show substantial performance inflations even after 2002.

The paper also contributes to the mutual fund flow literature. I find that managers who pump for star funds in the family enjoy more future inflows, controlling for fund and family characteristics (e.g., fund performance and spillover effect). More interestingly, pumping managers receive more future inflows than non-pumping managers in the family, suggesting that managers of the fund family may redirect flows to compensate pumping managers. Moreover, the magnitude of such monotonic relation is economically significant. Conditional on performance, the average difference in future inflows between the top and the bottom portfolio pumping quintiles is 1.8% per quarter, compared with the spillover effect of 1.15% per quarter.

The paper is important to regulators, because it points out the current insufficient regulation on the mutual fund industry. Big corporate organizations, such as mutual fund families, find loopholes in the legal system, bypass regulators, and manipulate the market. Therefore, regulators should increase monitoring and disclosure requirement of fund companies. In particular, the paper shows that big families with relatively fewer top-performing funds and high performance inflation prior to 2002 are more likely to pump star funds at family level. Regulators should also pay attention to multi-funds managers, as they are more likely to pump their high performance funds at the expense of their low performance funds. Furthermore, the paper points out that families tend to pump stocks that are buried deep down in star fund portfolios, so that it is less likely to be detected.

The finding of flow subsidization for pumping managers also sheds light on the agency conflict in delegated portfolio management. Non-star fund managers may not act on behalf of their investors. Instead, they pump stocks held by star funds at the expense of investors. As documented in Carhart et al. (2002), new investors are misled by inflated performance of star funds at quarter end. Moreover, the issue of agency conflict found in the paper is worse than what we would expect from the previous literature. Existing and future investors in pumping funds also suffer from the issue. In particular, existing investors in pumping funds have to bear the cost of pumping, and future investors can potentially be redirected to pumping managers in order to subsidize managers' pumping effort.

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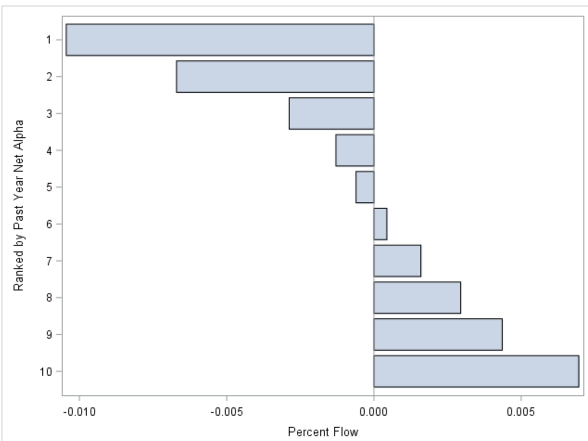
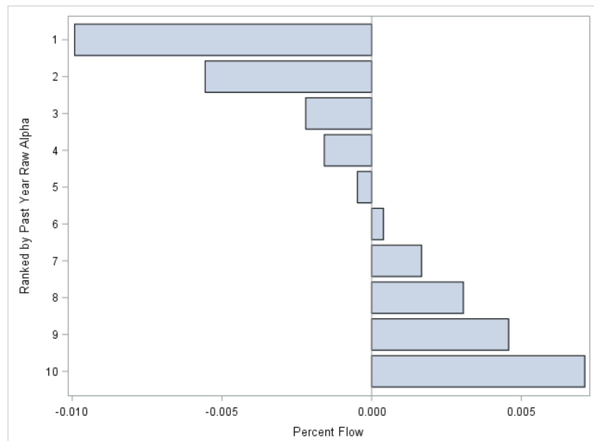
Figure 1

Percent Flow and Past Year Performance

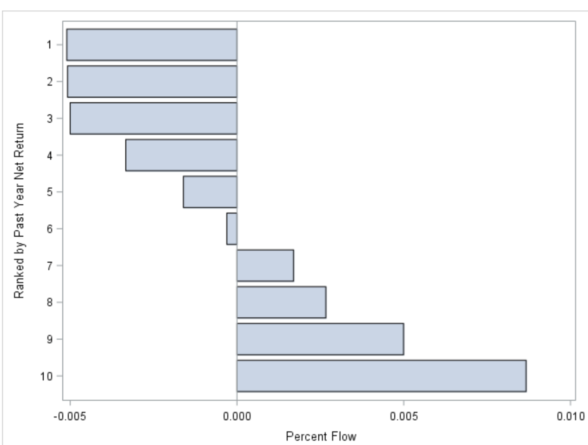
The figure shows the relationship between past year performance and fund percent flow. The sample contains U.S. equity funds from 1985 to 2014. Percent Flow for the fund i at month t is defined as $\frac{TNA_{i,t}-TNA_{i,t-1}\times(1+r_{i,t})}{TNA_{i,t-1}}$. I use four measures to proxy for past year performance: cumulative net return, cumulative raw return, cumulative net alpha and cumulative raw alpha. In each month, funds are ranked by their past year performance into deciles, and weighted percent flow is calculated within each decile. Monthly net (raw) alpha is firstly calculated using a 24-month rolling regression when monthly fund return data are available from CRSP, or using a 252-day rolling regression when daily data are available.



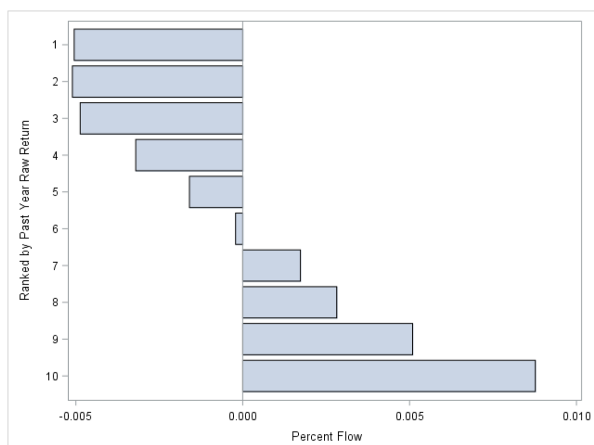
(a) Percent Flow and Cumulative Net Alpha



(b) Percent Flow and Cumulative Raw Alpha



(c) Percent Flow and Cumulative Net Return

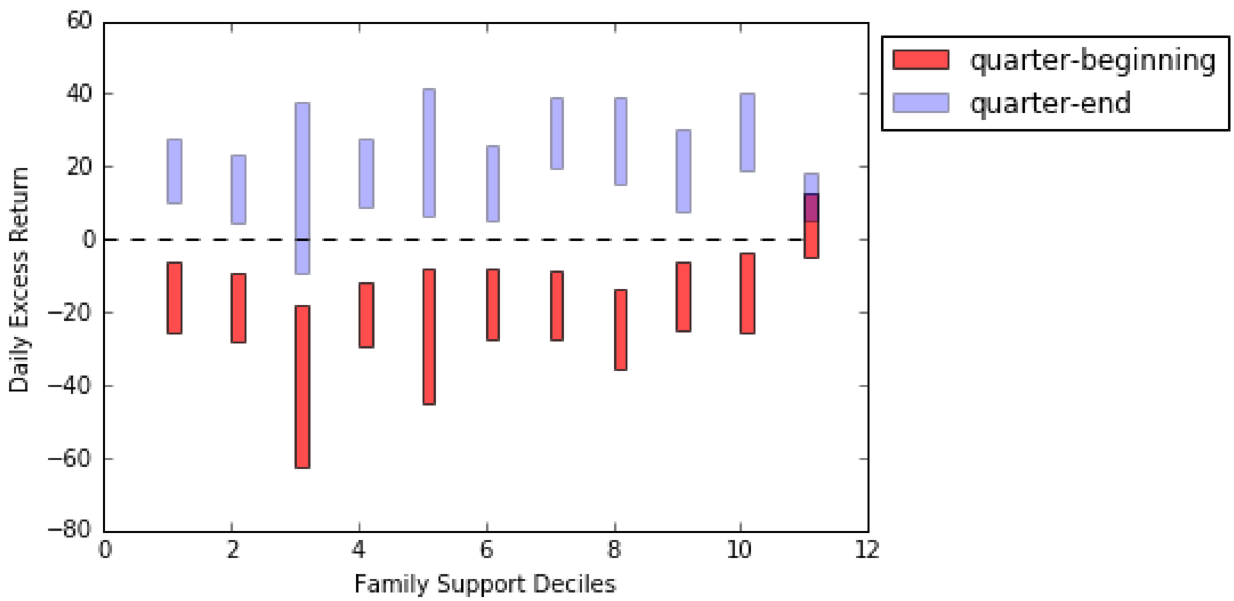


(d) Percent Flow and Cumulative Raw Return

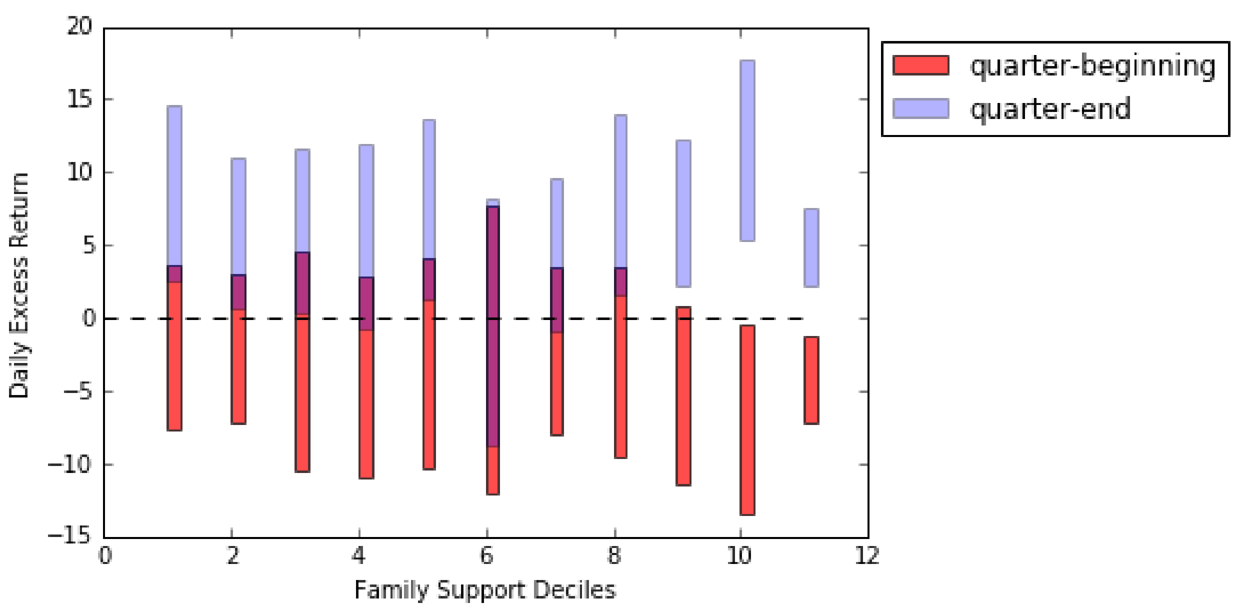
Figure 2

Performance Inflation and Family Pumping

The figure shows the performance inflation of star funds in mutual fund families at the turn of quarters (including the fourth quarter), sorted by *Family Support* into deciles. For the construction of star fund and *Family Support*, see Tables 4 and 5. For each decile of *Family Support*, I construct an equal-weighted index of funds based on their decile. After 2002, each index has 3,021 observations. For each index, I then run the regression specification (8) to capture the inflation at the turn of quarters, including the fourth quarter, and plot the 95% confidence intervals. The dependent variable is the excess return of the market.

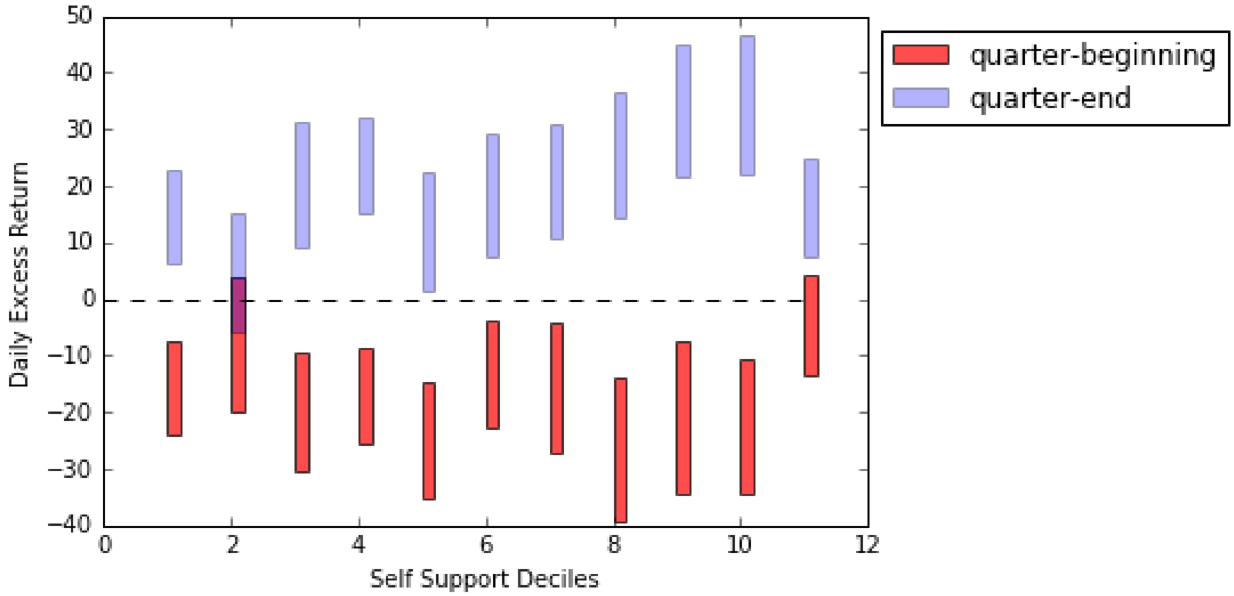


(a) 1990 - 2002

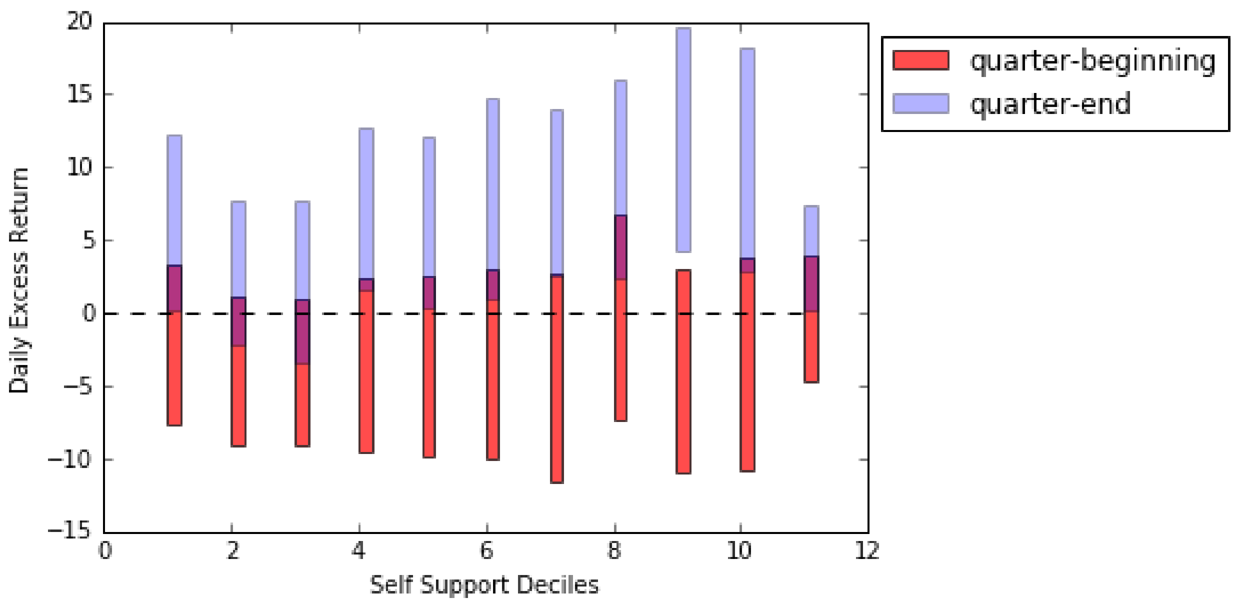


(b) 2003 - 2014

Figure 3
Performance Inflation and Individual Pumping
The figure shows the performance inflation of star funds in mutual fund families at the turn of quarters (including the fourth quarter), sorted by *Self Support* into deciles. For each decile of *Self Support*, I construct an equal-weighted index of funds based on their decile. After 2002, each index has 3,021 observations. For each index, I then run the regression specification (8) to capture the inflation at the turn of quarters, including the fourth quarter, and plot 95% confidence intervals. The dependent variable is the excess return of the market.



(a) 1990 - 2002



(b) 2003 - 2014

Table 1
Summary Statistics

The table reports the summary statistics of main variables. The sample includes all domestic equity funds from 1990 to 2014. The data are recorded on a fund-quarter level. *Holding Support*$^{Net\ Purchase}$ is the sum of products between the net purchase of each stock made by the fund, and the holding weight of the corresponding stock in star funds' portfolio of the fund family (see detailed construction in Equation (5)). *Fund Expense* and *Fund Turnover* are the fund level annual expense ratio and turnover ratio from CRSP, respectively. *Fund TNA* is the fund level total asset managed at the quarter end. *Dollar flow* is the current quarter TNA minus the product of previous quarter TNA and current quarter return. *Percent Flow* is the dollar flow normalized by previous quarter TNA. *Manager Skill* is the 12-month moving average of the return gap defined in Kacperczyk et al. (2008). *Carhart Alpha* is calculated using Carhart (1997) 4-factor model and a 24-month rolling regression. *Fund Age* is the number of years between the fund inception date provided by the CRSP and the observation date. $Winner\ Prop_{i,t}$ is the proportion of winner stocks held by the fund i at the end of the quarter t. $Loser\ Prop_{i,t}$ is the proportion of loser stocks held by the fund i at the end of the quarter t. Winner (loser) stocks are the top (bottom) quintile stocks sorted by the past quarter performance. *Common Manager* is a dummy variable, which is equal to one if the fund shares at least one common manager with the star funds in the fund family. *Family Support* quantifies the aggregated favor received by the star funds through portfolio pumping at family level, which is the sum of products between *Net Shares Purchased* and *Star Weighting* (see detailed construction in Equation (3)). *Number of Funds in Family* is the number of funds in the fund family identified by *mgmt_name* in CRSP. *Family TNA* and *Family Dollar Flow* are the total of fund TNA and the total of dollar flow in the family, respectively. *Family Percent Flow* is the weighted percent flow of funds in the family.

Variable	Obs	Mean	Std. Dev.	Min	Max	P25	P50	P75
Fund Level Summary Statistics								
Holding Support$^{Net\ Purchase}$	50599	0.000534	0.00268	-0.137	0.114	-0.000216	0	0.000259
Fund Expense	124174	0.0121	0.0046	0.0014	0.0260	0.0095	0.0119	0.0147
Fund Turnover	124174	0.8230	0.7754	0.0300	4.8467	0.3200	0.6300	1.0400
Fund TNA	124174	1361.72	3102.23	6.60	19276.40	90.60	308.31	1078.82
Dollar Flow	122014	0.51	115.96	-427.26	580.72	-16.96	-1.90	5.93
Percent Flow	122014	0.0037	0.1284	-0.3147	0.8892	-0.0446	-0.0142	0.0243
Manager Skill	113706	-0.0015	0.0396	-0.1519	0.1543	-0.0150	-0.0014	0.0112
Carhart Alpha	124174	0.0025	0.0305	-0.0948	0.1036	-0.0124	0.0020	0.0166
Net Return	124174	0.0212	0.1046	-0.6193	1.3062	-0.0297	0.0294	0.0846
Fund Age	124174	15.62	13.01	2.00	90.52	7.41	11.99	18.51
Winner Prop	85860	0.2235	0.1375	0	1	0.1223	0.2102	0.3005
Loser Prop	85860	0.1074	0.0814	0	1	0.0510	0.0942	0.1459
Common Manager	97676	0.392	0.488	0	1	0	0	1
Family Level Summary Statistics								
Family Support	6971	0.1215	2.160	-34.56	109.57	-0.0233	0.0254	0.1727
Num of Funds	16810	7.95	10.14	2.00	124.00	3.00	4.00	10.00
Family TNA	16810	8334.49	18390.11	7.40	106017.80	338.90	1494.62	6552.43
Family Dollar Flow	16810	8.41	428.77	-1390.86	1844.33	-50.12	-2.33	37.96
Family Percent Flow	16810	0.0068	0.0906	-0.2152	0.5749	-0.0319	-0.0053	0.0270

Table 2
Cross-correlation Table

The table reports the correlation matrix of main variables. The sample includes all domestic equity funds from 1990 to 2014. The data are recorded on a fund-quarter level. *Holding Support*$^{Net\ Purchase}$ is the sum of products between the net purchase of each stock made by the fund, and the holding weight of the corresponding stock in star funds' portfolio in the fund family (see detailed construction in Equation (5)). *Fund Expense* and *Fund Turnover* are the fund level annual expense ratio and turnover ratio from CRSP, respectively. *Fund TNA* is the fund level total asset under management at the quarter end. *Dollar flow* is the current quarter TNA minus the product of previous quarter TNA and current quarter return. *Percent Flow* is the dollar flow normalized by previous quarter TNA. *Manager Skill* is the 12-month moving average of the return gap defined in Kacperczyk et al. (2008). *Carhart Alpha* is calculated using Carhart (1997) 4-factor model and a 24-month rolling regression. *Fund Age* is the number of years between the fund inception date provided by the CRSP and the observation date.

Variables	*Holding Support*$^{Net\ Purchase}$	*Fund Expense*	*Fund Turnover*	*Fund TNA*	*Dollar Flow*	*Percent Flow*	*Manager Skill*	*Carhart Alpha*	*Return*	*Fund Age*
Holding Support$^{Net\ Purchase}$	1.0000									
Fund Expense	0.0188	1.0000								
	(0.0001)									
Fund Turnover	0.0052	0.2939	1.0000							
	(0.2948)	(0.0000)								
Fund TNA	0.0187	-0.3218	-0.1912	1.0000						
	(0.0002)	(0.0000)	(0.0000)							
Dollar Flow	0.0411	-0.0577	-0.0251	0.0425	1.0000					
	(0.0000)	(0.0000)	(0.0000)	(0.0000)						
Percent Flow	0.0824	-0.0466	0.0114	0.0262	0.4262	1.0000				
	(0.0000)	(0.0000)	(0.0213)	(0.0000)	(0.0000)					
Manager Skill	-0.0130	0.0040	0.0168	-0.0251	-0.0171	-0.0042	1.0000			
	(0.0084)	(0.4203)	(0.0007)	(0.0000)	(0.0005)	(0.3927)				
Carhart Alpha	0.0159	-0.0454	-0.0353	0.0313	0.0385	0.0653	0.0688	1.0000		
	(0.0013)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)			
Net Return	0.0208	-0.0354	-0.0244	0.0325	0.0565	0.0675	-0.0628	0.2366	1.0000	
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
Fund Age	0.0106	-0.1167	-0.0848	0.3487	-0.1290	-0.0665	-0.0084	-0.0133	0.0121	1.0000
	(0.0313)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0885)	(0.0071)	(0.2768)	

Table 3
Flow Convexity and Spillover Effect

The table studies the determinants of the next quarter inflows. The Sample contains all U.S. domestic equity funds with TNA larger than $5 Million from 1990 to 2014. Observations are aggregated at the fund-quarter level. Dependent variable $\%\ Flow_{i,t+1}$ is the next quarter percent flow of the fund i defined as $\frac{TNA_{i,t+1}-(1+r_{i,t})TNA_{i,t}}{TNA_{i,t}}$. $Carhart\ Alpha_t$ is the quarterly net alpha estimated using a 24-month rolling regression of monthly net return on Carhart (1997) 4 factors. To investigate the convexity of flows, funds are sorted by their alphas at quarter t into quintiles. $Top\ Fund_{i,t} = 1$ if fund i is in the top performance quintile. $Mid\ Fund_{i,t} = 1$ if fund i is in neither the top nor the bottom performance quintile. $Star\ Family_{i,t} = 1$ if at least one other fund in the family is in the top performance quintile. $Star\ Alpha_{i,t}$ is the alpha of the top performing fund other than fund i itself in fund $i's$ family, that is, $Star\ Alpha_{i,t} = \max_{j \neq i, j \in Family(i)} Carhart\ Alpha_{j,t}$. $Manager\ Skill_{t-1}$ is the lag of 12-month moving average of return gap defined in Kacperczyk et al. (2008).

	$\%\ Flow_{t+1}$				
	(1)	(2)	(3)	(4)	(5)
Carhart Alpha	0.521***	0.511***	0.363***	0.297***	0.291***
	(20.40)	(20.67)	(8.94)	(6.98)	(6.69)
Carhart Alpha^2		1.533***			
		(3.97)			
Winner Prop	0.0344***	0.0294***	0.0317***	0.0390***	0.0386***
	(5.07)	(4.39)	(4.70)	(5.92)	(5.84)
Loser Prop	-0.00937	-0.0188**	-0.0132	-0.0231***	-0.0233***
	(-1.14)	(-2.23)	(-1.62)	(-2.77)	(-2.78)
Mid Fund			0.00498***	0.00412**	0.00451**
			(2.80)	(2.23)	(2.43)
Top Fund			0.0174***	0.0153***	0.0160***
			(5.92)	(5.02)	(5.24)
Star Family				0.0115***	
				(7.91)	
Star Alpha					0.0629***
					(2.61)
$Manager\ Skill_{t-1}$	0.0778***	0.0775***	0.0774***	0.0751***	0.0761***
	(4.76)	(4.74)	(4.73)	(4.34)	(4.39)
Fund Expense	-0.899***	-0.927***	-0.928***	-0.240	-0.240
	(-4.98)	(-5.14)	(-5.16)	(-0.93)	(-0.93)
Fund Turnover	0.000766	0.000671	0.000699	-0.00281*	-0.00283*
	(0.49)	(0.43)	(0.45)	(-1.92)	(-1.94)
Fund Size	-0.00270***	-0.00268***	-0.00268***	-0.00527***	-0.00531***
	(-6.17)	(-6.12)	(-6.10)	(-8.50)	(-8.57)
Family Expense				0.0686	0.0881
				(0.34)	(0.43)
Family Turnover				0.000784	0.000764
				(0.27)	(0.26)
Family Size				-0.000993	-0.000463
				(-0.55)	(-0.26)
Time and Style Fixed Effects	Yes	Yes	Yes	Yes	Yes
Family Fixed Effects	No	No	No	Yes	Yes
N	81259	81259	81259	75273	75273
Adjusted R^2	0.0349	0.0353	0.0358	0.0736	0.0726
F	52.37	52.95	62.19	44.10	42.97

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4
Performance Reversals in Long/Short Portfolio

The table tests performance reversals of star funds in mutual fund families. I calculate the *Family Support* as the sum of products between the net purchase of each stock made by all non-star funds in the family, and the weight of the corresponding stock held by the star funds, normalized by the stock's trading volume (for detailed construction, please see Equation (3)). I then sort fund families in each year by their *Family Support* into deciles, so that each decile contains 15 funds on average. The dummy variable *High Support* is equal to one if the family is in the top decile, and zero otherwise. Two equal-weighted portfolios are constructed based on the dummy. The long/short portfolio is created by buying the *High Support* portfolio and selling the other one. The depedent variable is the daily return of the long/short portfolio. The independent variables are a set of time dummies. $YEND_t$ is 1 if it is the last trading day of December. $YBEG_t$ is 1 if $YEND_{t-1}$ is 1. $QEND_t$ is 1 if it is the last trading day of March, June, or September, and $QBEG_t$ is 1 if $QEND_{t-1}$ is 1. *MEND* is 1 if it is the last trading day of January, February, April, May, July, August, October, or November. $MBEG_t$ is 1 if $MEND_{t-1}$ is 1.

	$R^{L/S}$	
	1992 - 2002	2003 - 2014
	(1)	(2)
YEND	10.12**	5.791***
	(2.11)	(2.70)
YBEG	14.42*	-5.964*
	(1.91)	(-1.75)
QEND	12.06***	4.667***
	(2.95)	(2.82)
QBEG	0.531	-3.627**
	(0.10)	(-2.26)
MEND	2.340	2.215**
	(1.05)	(2.38)
MBEG	-2.440	-3.306***
	(-0.95)	(-3.03)
Constant	-0.572	0.104
	(-1.26)	(0.58)
N	2520	3021
Adjusted R^2	0.0069	0.0131
F	3.102	6.412

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5
Portfolio Pumping at Family Level

The table tests the timing of family level pumping in a panel setting. I sort star funds by *Family Support* into deciles, and construct 10 equal-weighted indexes of funds, each corresponding to one decile. The dummy variable *High Support* is equal to one if the index is created using funds in the top decile, and zero otherwise. The dependent variable is the excess daily return of the market. The independent variables are the time dummies (see Table 4), *High Support* dummy, and their interaction terms. Standard errors are clustered by the sorting decile.

	Excess Daily Return	
	1990-2002	2003-2014
	(1)	(2)
High Support × *YBEG*	11.64***	-4.179**
	(3.49)	(-2.88)
High Support × *YEND*	11.72**	6.677***
	(3.05)	(5.99)
High Support × *QBEG*	1.749	-4.009***
	(0.79)	(-5.20)
High Support × *QEND*	11.82**	4.775***
	(3.04)	(4.01)
High Support × *MBEG*	-3.013*	-3.276***
	(-1.94)	(-5.06)
High Support × *MEND*	2.189**	2.493***
	(2.60)	(3.38)
High Support	-0.664**	0.213*
	(-2.41)	(1.98)
YBEG	-23.61***	-11.44***
	(-7.09)	(-7.88)
QBEG	-17.30***	-0.0851
	(-7.86)	(-0.11)
MBEG	2.122	0.888
	(1.37)	(1.37)
YEND	23.19***	-0.00697
	(6.04)	(-0.01)
QEND	16.20***	8.375***
	(4.16)	(7.03)
MEND	3.308***	7.148***
	(3.93)	(9.70)
Constant	3.407***	2.042***
	(12.36)	(19.01)
N	23443	28699
Adjusted R^2	0.0107	0.00691

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6
Double Sort of Future Inflow

This table tests whether pumping managers receive more future inflows, conditional on performance ans spillover effect. In Panel A, all non-star funds are double sorted by past year aggregated alpha and *Holding Support*$^{Net\ Purchase}$ into 5-by-5 quintiles at each quarter end. In Panel B, all non-star funds are double sorted by the proportion of assets in the family managed by star funds and *Holding Support*$^{Net\ Purchase}$ into 5-by-5 quintiles at each quarter end. The mean inflow of funds (in percentage point) in each quintile is reported, as well as the difference in means.

Panel A: Double Sort on *Holding Support*$^{Net\ Purchase}$ and *Carhart Alpha*

$Q_{HS} \backslash Q_{Carhart\ Alpha}$	1	2	3	4	5	L/S
1	-3.99	-2.53	-1.82	-1.30	0.11	4.10
	(-15.90)	(-9.95)	(-6.74)	(-4.66)	(0.39)	(11.03)
2	-3.50	-1.80	-0.85	-0.04	0.58	4.08
	(-15.73)	(-7.59)	(-3.46)	(-0.15)	(2.26)	(12.01)
3	-2.17	-1.19	-0.47	0.31	1.75	3.92
	(-6.01)	(-3.29)	(-1.33)	(0.86)	(4.72)	(7.57)
4	-2.97	-1.22	0.24	0.90	2.36	5.33
	(-9.89)	(-4.23)	(0.90)	(3.43)	(8.81)	(13.24)
5	-3.32	-0.97	0.00	1.18	2.53	5.85
	(-10.61)	(-3.38)	(0.01)	(4.36)	(9.94)	(14.50)
L/S	0.68	1.56	1.83	2.47	2.42	
	(1.79)	(4.06)	(4.71)	(6.37)	(6.47)	

Panel B: Double Sort on *Holding Support*$^{Net\ Purchase}$ and *Star Portion*

$Q_{HS} \backslash Q_{Star\ Portion}$	1	2	3	4	5	L/S
1	-2.33	-2.46	-1.80	-1.91	-1.53	0.81
	(-8.90)	(-9.08)	(-6.48)	(-7.14)	(-5.83)	(2.18)
2	-1.06	-1.12	-1.24	-1.85	-1.12	-0.07
	(-4.92)	(-4.68)	(-4.99)	(-7.26)	(-4.17)	(-0.19)
3	-0.59	-0.45	-0.10	-0.46	-0.19	0.40
	(-1.72)	(-1.24)	(-0.29)	(-1.29)	(-0.47)	(0.74)
4	-0.10	-0.38	0.24	0.29	0.12	0.22
	(-0.35)	(-1.44)	(0.88)	(1.05)	(0.40)	(0.53)
5	0.29	-0.33	0.23	-0.01	0.52	0.23
	(1.01)	(-1.12)	(0.76)	(-0.05)	(1.96)	(0.59)
L/S	2.62	2.13	2.02	1.90	2.05	
	(6.73)	(5.36)	(4.97)	(5.02)	(5.48)	

t statistics in parentheses

Table 7
Visible vs. Invisible *Holding Support*

This table takes a closer examination of the monotonic relation between *Holding Support* and future inflows as shown in Table 6. *Holding Support* is further divided into two parts, depending on whether the stocks pumped fall into the top-10 holding list of star funds. $\textit{Holding Support}^{\textit{Visible Net Purchase}}$ (VHS) and $\textit{Holding Support}^{\textit{Invisible Net Purchase}}$ (IHS) are defined in Equations (11) and (12), respectively. Funds are double sorted by their past year performance and *VHS* (*IHS*) into 5 × 5 quintiles, and the mean of next quarter fund inflows are calculated within each block.

Panel A: Double Sort on *Visible Holding Support* and *Carhart Alpha*

$Q_{VHS} \backslash Q_{Carhart\ Alpha}$	1	2	3	4	5	L/S
1	-3.75	-2.17	-1.51	-0.80	0.34	4.09
	(-16.41)	(-9.56)	(-6.42)	(-3.36)	(1.40)	(12.30)
2	-3.24	-1.54	-0.58	-0.03	0.79	4.03
	(-16.96)	(-7.33)	(-2.67)	(-0.13)	(3.44)	(13.46)
3	0.17	-1.95	1.10	2.70	3.14	2.97
	(0.15)	(-1.67)	(1.09)	(2.73)	(2.96)	(1.90)
4	-2.83	-1.05	0.40	0.94	2.28	5.12
	(-7.89)	(-3.30)	(1.37)	(3.38)	(8.13)	(11.22)
5	-3.54	-1.44	-0.42	1.03	2.72	6.26
	(-11.08)	(-5.05)	(-1.53)	(3.82)	(10.74)	(15.35)
L/S	0.21	0.73	1.09	1.83	2.38	
	(0.54)	(2.00)	(3.01)	(5.09)	(6.81)	

Panel B: Double Sort on *Invisible Holding Support* and *Carhart Alpha*

$Q_{IHS} \backslash Q_{Carhart\ Alpha}$	1	2	3	4	5	L/S
1	-4.37	-2.39	-1.68	-1.16	0.23	4.60
	(-17.44)	(-9.52)	(-6.21)	(-4.15)	(0.85)	(12.35)
2	-3.42	-1.70	-1.00	-0.07	0.65	4.08
	(-15.84)	(-7.37)	(-4.20)	(-0.29)	(2.62)	(12.35)
3	-2.25	-1.56	-0.14	0.69	2.04	4.29
	(-5.52)	(-4.02)	(-0.36)	(1.86)	(5.15)	(7.55)
4	-2.27	-1.23	0.07	0.96	2.44	4.72
	(-7.47)	(-4.27)	(0.25)	(3.65)	(9.27)	(11.72)
5	-3.36	-0.99	0.09	0.85	2.19	5.55
	(-11.04)	(-3.39)	(0.32)	(3.13)	(8.52)	(13.93)
L/S	1.00	1.41	1.77	2.00	1.95	
	(2.55)	(3.65)	(4.59)	(5.16)	(5.18)	

t statistics in parentheses

Table 8
Multiple Regression of Future Inflow on *Holding Support*

The table studies the relation between a fund's next quarter inflow and the *Holding Support* measure. All funds are sorted by their past-year Carhart 4-factor alphas into quintiles, and a fund is coded as a star fund if its past-year alpha is in the top quintile. The sample includes all non-star funds in the fund family. The Dependent variable in all specifications is the fund's next quarter inflow. The constructions of $Holding\ Support^{Net\ Purchase}$ is shown in Equation (5). The constructions of $Holding\ Support^{Visible\ Net\ Purchase}$ and $Holding\ Support^{Invisible\ Net\ Purchase}$ are shown in Equations (11) and (12). *Carhart Alpha* is the quarterly net alpha estimated using a 24-month rolling regression of monthly net return on Carhart (1997) 4 factors. $Star\ Flow_{t+1}$ is the weighted next quarter inflow of star funds in the family. $Star\ Alpha_{i,t}$ is the star fund performance in the family. $Winner\ Prop_{i,t}$ is the proportion of winner stocks held by fund i at the end of quarter t. $Loser\ Prop_{i,t}$ is the proportion of loser stocks held by fund i at the end of quarter t. Winner (loser) stocks are the top (bottom) quintile stocks sorted by the past quarter performance. $Manager\ Skill_{t-1}$ is the lag of 12-month moving average of return gap defined in Kacperczyk et al. (2008). *Fund Expense* and *Fund Turnover* are the fund level annual expense ratio and turnover ratio from CRSP, respectively. *Family Expense* and *Family Turnover* are the size weighted expense ratio, and turnover ratio of all funds in the fund family, excluding the fund itself, respectively. *Family Size* is the natural logarithm of the fund family's TNA, excluding the fund itself. All specifications include time, style, and family fixed effects, and all standard errors are two-way clustered at time and family level.

	% $Flow_{t+1}$			
	(1)	(2)	(3)	(4)
$HS^{Net\ Purchase}$	0.870**			
	(2.12)			
$HS^{Visible\ Net\ Purchase}$		0.873*		0.303
		(1.67)		(0.52)
$HS^{Invisible\ Net\ Purchase}$			2.929**	2.568*
			(2.49)	(1.95)
Carhart Alpha	0.302***	0.302***	0.301***	0.301***
	(6.96)	(6.97)	(6.91)	(6.90)
$Star\ Flow_{t+1}$	0.155***	0.155***	0.154***	0.154***
	(6.87)	(6.89)	(6.87)	(6.87)
Star Alpha	-0.0149	-0.0152	-0.0143	-0.0144
	(-0.86)	(-0.88)	(-0.82)	(-0.83)
Winner Prop	0.0213	0.0213	0.0219	0.0217
	(1.20)	(1.20)	(1.22)	(1.22)
Loser Prop	-0.0334**	-0.0335**	-0.0336**	-0.0335**
	(-2.39)	(-2.39)	(-2.40)	(-2.39)
$Manager\ Skill_{t-1}$	0.0559**	0.0560**	0.0558**	0.0558**
	(2.03)	(2.03)	(2.02)	(2.02)
Fund Expense	-1.468***	-1.469***	-1.466***	-1.466***
	(-3.26)	(-3.26)	(-3.26)	(-3.26)
Fund Turnover	-0.00183	-0.00182	-0.00183	-0.00183
	(-0.63)	(-0.63)	(-0.64)	(-0.64)
Fund Size	-0.00549***	-0.00549***	-0.00549***	-0.00549***
	(-4.20)	(-4.20)	(-4.19)	(-4.20)
Family Size	-0.00150	-0.00152	-0.00146	-0.00147
	(-0.40)	(-0.40)	(-0.39)	(-0.39)
Family Expense	0.203	0.205	0.198	0.199
	(0.66)	(0.67)	(0.65)	(0.65)
Family Turnover	0.00735	0.00733	0.00732	0.00734
	(1.36)	(1.36)	(1.36)	(1.36)
Time and Style Fixed Effects	Yes	Yes	Yes	Yes
Family Fixed Effects	Yes	Yes	Yes	Yes
N	36887	36887	36887	36887
Adjusted R^2	0.0852	0.0851	0.0852	0.0852
F	27.72	24.91	26.81	27.04

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 9

Multiple Regression of Future Inflow on *Holding Support* in Subsamples

The table studies the relation between a fund's next quarter inflow and the *Holding Support* measure in two subsamples. Columns (1) to (4) study the subsample before 2002, and columns (5) to (8) study the subsample after 2002. All funds are sorted by their past-year Carhart 4-factor alphas into quintiles, and a fund is coded as a star fund if its past-year alpha is in the top quintile. The sample includes all non-star funds in the fund family. The Dependent variable in all specifications is the fund's next quarter inflow. The constructions of $\textit{Holding Support}^{\textit{Net Purchase}}$ is shown in Equation (5). The constructions of $\textit{Holding Support}^{\textit{Visible Net Purchase}}$ and $\textit{Holding Support}^{\textit{Invisible Net Purchase}}$ are shown in Equations (11) and (12). *Carhart Alpha* is the quarterly net alpha estimated using a 24-month rolling regression of monthly net return on Carhart (1997) 4 factors. $\textit{Star Flow}_{t+1}$ is the weighted next quarter inflow of star funds in the family. $\textit{Star Alpha}_{i,t}$ is the star fund performance in the family. $\textit{Winner Prop}_{i,t}$ is the proportion of winner stocks held by fund i at the end of quarter t. $\textit{Loser Prop}_{i,t}$ is the proportion of loser stocks held by fund i at the end of quarter t. Winner (loser) stocks are the top (bottom) quintile stocks sorted by the past quarter performance. $\textit{Manager Skill}_{t-1}$ is the lag of 12-month moving average of return gap defined in Kacperczyk et al. (2008). *Fund Expense* and *Fund Turnover* are the fund level annual expense ratio and turnover ratio from CRSP, respectively. *Family Expense* and *Family Turnover* are the size weighted expense ratio, and turnover ratio of all funds in the fund family, excluding the fund itself, respectively. *Family Size* is the natural logarithm of the fund family's TNA, excluding the fund itself. All specifications include time, style, and family fixed effects, and all standard errors are two-way clustered at time and family level.

	$\% \textit{Flow}_{t+1}$							
	1990-2002				2003-2014			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$HS^{\textit{Net Purchase}}$	0.0960				1.226**			
	(0.12)				(2.38)			
$HS^{\textit{Visible Net Purchase}}$		0.152		0.191		1.216*		0.445
		(0.13)		(0.14)		(1.96)		(0.67)
$HS^{\textit{Invisible Net Purchase}}$			0.0826	-0.139			4.212**	3.680*
			(0.05)	(-0.07)			(2.45)	(1.89)
Carhart Alpha	0.299***	0.299***	0.299***	0.299***	0.289***	0.289***	0.287***	0.288***
	(4.33)	(4.33)	(4.34)	(4.34)	(4.83)	(4.83)	(4.76)	(4.78)
$\textit{Star Flow}_{t+1}$	0.139***	0.139***	0.139***	0.139***	0.153***	0.153***	0.153***	0.153***
	(3.73)	(3.74)	(3.73)	(3.74)	(7.39)	(7.40)	(7.37)	(7.37)
Star Alpha	-0.0301	-0.0302	-0.0302	-0.0302	-0.0131	-0.0134	-0.0125	-0.0126
	(-0.86)	(-0.86)	(-0.86)	(-0.87)	(-0.43)	(-0.45)	(-0.41)	(-0.42)
Winner Prop	0.0531*	0.0531*	0.0532*	0.0531*	0.00488	0.00480	0.00602	0.00565
	(1.90)	(1.90)	(1.89)	(1.90)	(0.24)	(0.23)	(0.29)	(0.27)
Loser Prop	-0.0140	-0.0140	-0.0140	-0.0139	-0.0416**	-0.0419**	-0.0417**	-0.0416**
	(-0.56)	(-0.56)	(-0.56)	(-0.56)	(-2.58)	(-2.59)	(-2.59)	(-2.57)
$\textit{Manager Skill}_{t-1}$	0.0789*	0.0789*	0.0790*	0.0789*	0.0460	0.0463	0.0456	0.0456
	(1.85)	(1.85)	(1.85)	(1.85)	(1.50)	(1.52)	(1.48)	(1.48)
Fund Expense	0.00248	0.00240	0.00253	0.00231	-2.378***	-2.379***	-2.379***	-2.379***
	(0.01)	(0.00)	(0.01)	(0.00)	(-4.27)	(-4.27)	(-4.28)	(-4.28)
Fund Turnover	-0.00890***	-0.00890***	-0.00890***	-0.00890***	0.00155	0.00155	0.00154	0.00154
	(-3.42)	(-3.39)	(-3.42)	(-3.39)	(0.43)	(0.43)	(0.42)	(0.43)
Fund Size	-0.00454**	-0.00454**	-0.00453***	-0.00454**	-0.00592***	-0.00591***	-0.00592***	-0.00592***
	(-2.54)	(-2.30)	(-2.64)	(-2.30)	(-3.47)	(-3.46)	(-3.29)	(-3.14)
Family Size	0.0142**	0.0142**	0.0142**	0.0142**	-0.0138	-0.0138	-0.0137	-0.0137
	(2.18)	(2.18)	(2.17)	(2.17)	(-1.62)	(-1.62)	(-1.62)	(-1.62)
Family Expense	0.888*	0.889*	0.888*	0.889*	-0.521	-0.517	-0.522	-0.523
	(1.82)	(1.82)	(1.82)	(1.82)	(-0.92)	(-0.91)	(-0.92)	(-0.92)
Family Turnover	0.0146*	0.0146*	0.0146*	0.0146*	-0.00689	-0.00695	-0.00693	-0.00689
	(1.79)	(1.78)	(1.79)	(1.78)	(-1.06)	(-1.06)	(-1.00)	(-1.00)
Time and Style Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11412	11412	11412	11412	25455	25455	25455	25455
Adjusted R^2	0.147	0.147	0.147	0.147	0.0809	0.0808	0.0810	0.0811
F	9.752	9.651	9.731	9.471	17.12	17.74	18.45	17.71

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10

Future Retail/Institution Inflow and *Holding Support*

The table studies how next quarter retail/institution flow reacts to *Holding Support*. Columns (1) and (2) study the subsample before 2002, and columns (3) and (4) study the subsample after 2002. All funds are sorted by their past-year Carhart 4-factor alphas into quintiles, and a fund is coded as a star fund if its past-year alpha is in the top quintile. The sample includes all non-star funds in the fund family. The Dependent variable is the fund's next quarter retail/institutional inflow. The constructions of $\textit{Holding Support}^{Net\ Purchase}$ is shown in Equation (5). $\textit{Carhart Alpha}_t$ is the quarterly net alpha estimated using a 24-month rolling regression of monthly net return on Carhart (1997) 4 factors. $\textit{Star Flow}_{t+1}$ is the weighted next quarter inflow of star funds in the family. $\textit{Winner Prop}_{i,t}$ is the proportion of winner stocks held by fund i at the end of quarter t. $\textit{Loser Prop}_{i,t}$ is the proportion of loser stocks held by fund i at the end of quarter t. Winner (loser) stocks are the top (bottom) quintile stocks sorted by the past quarter performance. $\textit{Star Alpha}_{i,t}$ is the star fund performance in the family. $\textit{Manager Skill}_{t-1}$ is the lag of 12-month moving average of return gap defined in Kacperczyk et al. (2008). *Fund Expense* and *Fund Turnover* are the fund level annual expense ratio and turnover ratio from CRSP, respectively. *Family Expense* and *Family Turnover* are the size weighted expense ratio, and turnover ratio of all funds in the fund family, excluding the fund itself, respectively. *Family Size* is the natural logarithm of the fund family's TNA, excluding the fund itself. All specifications include time, style, and family fixed effects, and all standard errors are two-way clustered at time and family level.

	1990-2002		2003-2014	
	(1)	(2)	(3)	(4)
	% $\textit{Inst Flow}_{t+1}$	% $\textit{Retail Flow}_{t+1}$	% $\textit{Inst Flow}_{t+1}$	% $\textit{Retail Flow}_{t+1}$
$HS^{Net\ Purchase}$	1.503	-0.541	4.648***	1.243*
	(0.74)	(-0.41)	(2.78)	(1.97)
Carhart Alpha	-0.0579	0.329***	0.486***	0.304***
	(-0.22)	(4.06)	(3.18)	(4.28)
$\textit{Star Flow}_{t+1}$	0.221***	0.181***	0.192***	0.114***
	(3.35)	(2.96)	(2.76)	(4.29)
Star Alpha	-0.0414	-0.0424	-0.0316	-0.00486
	(-0.39)	(-0.82)	(-0.42)	(-0.13)
Winner Prop	0.0770	0.0541	-0.0194	0.00457
	(0.99)	(1.18)	(-0.58)	(0.19)
Loser Prop	-0.0348	0.00791	-0.0898	-0.0374**
	(-0.40)	(0.25)	(-1.68)	(-2.16)
$\textit{Manager Skill}_{t-1}$	0.441***	0.0385	-0.0562	0.0571
	(3.75)	(0.66)	(-0.51)	(1.31)
Fund Expense	3.807	-2.358**	2.837**	-4.238***
	(1.63)	(-2.42)	(2.07)	(-6.28)
Fund Turnover	-0.00302	-0.00737*	-0.00365	0.00428
	(-0.30)	(-2.08)	(-0.69)	(0.93)
Fund Size	0.00673	-0.0110***	-0.00146	-0.00910***
	(0.82)	(-3.83)	(-0.52)	(-3.94)
Family Size	0.0178	0.0154	-0.0153	-0.0107
	(0.84)	(1.31)	(-0.54)	(-1.19)
Family Expense	-0.756	1.410	-1.371	0.353
	(-0.38)	(1.59)	(-0.86)	(0.63)
Family Turnover	0.117	0.0258*	-0.0544***	-0.00447
	(1.49)	(1.82)	(-2.84)	(-0.47)
Time and Style Fixed Effects	Yes	Yes	Yes	Yes
Family Fixed Effects	Yes	Yes	Yes	Yes
N	4049	7444	17382	21132
Adjusted R^2	0.155	0.141	0.0585	0.0763
F	3.043	9.714	5.570	15.48

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 11

Determinants of *Holding Support*

The table studies the determinants of the fund's *Holding Support*. The Dependent variable is *Holding Support* defined in Equation (5). *Common Manager* is a dummy variable, which is equal to one if the fund shares at least one common manager with the star funds of the family. *Fourth Quarter* is a dummy variable, which is equal to one if the observation date is in the fourth quarter of the calendar year. *Outsourced* is a dummy variable, which is equal to one if the fund is outsourced. *Inst Share* is the proportion of TNAs in institutional share classes of a fund. *Carhart* $Alpha_t$ is the quarterly net alpha estimated using a 24-month rolling regression of monthly net return on Carhart (1997) 4 factors. *Manager* $Skill_{t-1}$ is the lag of 12-month moving average of return gap defined in Kacperczyk et al. (2008). *Fund Expense* and *Fund Turnover* are the fund level annual expense ratio and turnover ratio from CRSP, respectively. *Family Expense* and *Family Turnover* are the size weighted expense ratio, and turnover ratio of all funds in the fund family, excluding the fund itself, respectively. *Family Size* is the natural logarithm of the fund family's TNA, excluding the fund itself. *Fund Age* is the number of years between the fund inception date provided by CRSP and the observation date. All specifications include style and family fixed effects, and all standard errors are clustered at family level.

	$HS^{Net\ Purchase}$		
	(1)	(2)	(3)
Common Manager		3.806***	3.042***
		(9.45)	(7.03)
Fourth Quarter			1.848***
			(6.95)
Fourth Quarter × *Common Manager*			2.950***
			(2.86)
Outsourced	-0.305***	-0.360***	-0.367***
	(-2.86)	(-3.45)	(-3.47)
Inst Share	-1.864***	-1.006**	-0.975**
	(-3.97)	(-2.12)	(-2.06)
Carhart Alpha[1,2]	5.894	1.274	4.800
	(1.11)	(0.25)	(0.95)
Manager $Skill_{t-1}$	7.597*	7.689*	8.298*
	(1.78)	(1.80)	(1.95)
Fund Expense	-56.16	-12.68	-9.398
	(-1.37)	(-0.30)	(-0.22)
Fund Turnover	0.210	0.276	0.278
	(1.20)	(1.49)	(1.51)
Fund Size	0.370***	0.434***	0.426***
	(3.88)	(4.08)	(4.03)
log(*Fund Age*)	-0.379	-0.339	-0.348
	(-1.63)	(-1.36)	(-1.40)
Family Size	-0.943**	-1.002**	-1.035**
	(-2.47)	(-2.41)	(-2.50)
Family Expense	31.29	47.80	53.77
	(0.84)	(1.23)	(1.39)
Family Turnover	-0.623	-0.00488	0.00956
	(-0.90)	(-0.01)	(0.01)
Family and Style Fixed Effect	Yes	Yes	Yes
N	39029	35650	35650
Adjusted R^2	0.118	0.115	0.118
F	14.09	15.92	18.00

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 12

Determinants of *Holding Support in Subsamples*

The table studies the determinants of the fund's *Holding Support*. Columns (1) to (3) study the subsample before 2002, and columns (4) to (6) study the subsample after 2002. All funds are sorted by their past-year Carhart 4-factor alphas into quintiles, and a fund is coded as a star fund if its past-year alpha is in the top quintile. The sample includes all non-star funds in the fund family. The Dependent variables is *Holding Support* defined in Equation (5). *Common Manager* is a dummy variable, which is equal to one if the fund shares at least one common manager with the star funds of the family. *Fourth Quarter* is a dummy variable, which is equal to one if the observation date is in the fourth quarter of the calendar year. *Outsourced* is a dummy variable, which is equal to one if the fund is outsourced. *Inst Share* is the proportion of TNAs in institutional share classes of a fund. *Carhart* $Alpha_t$ is the quarterly net alpha estimated using a 24-month rolling regression of monthly net return on Carhart (1997) 4 factors. *Manager* $Skill_{t-1}$ is the lag of 12-month moving average of return gap defined in Kacperczyk et al. (2008). *Fund Expense* and *Fund Turnover* are the fund level annual expense ratio and turnover ratio from CRSP, respectively. *Family Expense* and *Family Turnover* are the size weighted expense ratio, and turnover ratio of all funds in the fund family, excluding the fund itself, respectively. *Family Size* is the natural logarithm of the fund family's TNA, excluding the fund itself. *Fund Age* is the number of years between the fund inception date provided by CRSP and the observation date. All specifications include style and family fixed effects, and all standard errors are clustered at family level.

	$HS^{Net\ Purchase}$					
	1990-2002			2003-2014		
	(1)	(2)	(3)	(4)	(5)	(6)
Common Manager		4.878***	5.049***		3.091***	2.090***
		(5.28)	(4.90)		(7.57)	(4.73)
Fourth Quarter			-0.142			2.285***
			(-0.29)			(7.31)
Fourth Quarter × *Common Manager*			-0.598			4.006***
			(-0.31)			(3.30)
Outsourced	-0.380***	-0.383**	-0.380**	-0.108	-0.221	-0.203
	(-2.58)	(-2.50)	(-2.45)	(-0.37)	(-0.73)	(-0.67)
Inst Share	-1.890	-1.677	-1.692	-1.665***	-0.665	-0.672
	(-1.54)	(-1.30)	(-1.31)	(-3.27)	(-1.33)	(-1.35)
Carhart $Alpha^{1,2}$	13.05	1.459	1.070	-0.436	-1.652	2.732
	(1.06)	(0.13)	(0.10)	(-0.11)	(-0.42)	(0.70)
Manager $Skill_{t-1}$	11.90*	11.38*	11.30*	2.926	3.014	3.135
	(1.91)	(1.93)	(1.92)	(0.46)	(0.46)	(0.48)
Fund Expense	-29.34	-9.146	-10.15	-87.33**	-43.92	-41.14
	(-0.34)	(-0.10)	(-0.11)	(-2.03)	(-0.98)	(-0.92)
Fund Turnover	0.198	0.303	0.302	0.225	0.282	0.287
	(0.61)	(0.89)	(0.89)	(1.22)	(1.45)	(1.48)
Fund Size	0.389*	0.456*	0.458*	0.277***	0.339***	0.336***
	(1.76)	(1.89)	(1.89)	(2.96)	(3.27)	(3.25)
log(*Fund Age*)	-0.394	-0.497	-0.496	-0.0428	0.0311	0.000511
	(-0.99)	(-1.18)	(-1.18)	(-0.15)	(0.10)	(0.00)
Family Size	-0.408	0.226	0.247	-0.216	-0.378	-0.432
	(-0.36)	(0.20)	(0.21)	(-0.51)	(-0.82)	(-0.94)
Family Expense	28.67	75.53	73.93	10.60	4.230	21.38
	(0.24)	(0.60)	(0.58)	(0.24)	(0.09)	(0.48)
Family Turnover	-1.850	-0.261	-0.283	-0.804	-0.258	-0.212
	(-0.93)	(-0.16)	(-0.17)	(-0.99)	(-0.33)	(-0.27)
Family and Style Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
N	9674	9064	9064	29334	26566	26566
Adjusted R^2	0.258	0.244	0.245	0.114	0.118	0.123
F	5.821	6.781	6.147	10.37	10.23	13.02

t statistics in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 13

Family Support Sorted by Year-end Reversals in 2002

The table shows whether the heavily pumped mutual fund families before 2002 are the ones that employ family level pumping strategy. I first sort fund families by their star funds' return reversal at the end of 2002 into terciles. The reversal is defined as the return difference of star funds in the last trading day of 2002 and the first trading day of 2003. Therefore, families in the top tercile are the ones pumped the most in 2002. Second, I calculate the mean of *Family Support* for families in each tercile and in each year after 2002.

	Reversal Terciles in 2002		
Year	Tercile 1	Tercile 2	Tercile 3
2003	0.0262	0.0339	0.0214
2004	0.0171	0.0264	0.0323
2005	0.0196	0.0456	0.0509
2006	0.0176	0.0338	0.0371
2007	0.0361	0.0165	0.0105
2008	0.0126	0.0092	0.0012
2009	0.0117	0.0101	0.0218
2010	0.0665	0.1076	0.0735
2011	0.0177	0.0140	0.0353
2012	0.0048	0.0380	0.0194
2013	0.0475	0.0814	0.0765
2014	0.0392	0.0380	0.0480

Table 14
Determinants of *High Support*

The table studies the characteristics of mutual fund families that have the highest level of family level portfolio pumping. Mutual fund families are sorted by *Family Support* (Equation (3)) into deciles in each quarter. *High Support* is a 0/1 dummy variable which equals one if the family is in the top decile in the given quarter. I then run the logit regression of *High Support* on the following variables. *Family Alpha* is the weighted average of alphas of all funds in the family in the given quarter. *Family Alpha*$_{t-3,t-1}$ is the weighted average of the cumulative alphas of all funds in the family from the lag-3 quarter to the lag-1 quarter. *Family Size* is the natural logarithm of the total AUM managed by the family. *Family Expense* and *Family Turnover* are the weighted average of expense ratios and turnover ratios of all funds in the family, respectively. *Inst Share* is the proportion of assets managed for institutional investors in the family. *Outsourced* is the proportion of funds outsourced in the family. *Number of Funds* is the number of funds in the family. *Distinct Style* is the ratio of the number of unique fund styles to the number of funds in the family. *Star Portion* is the ratio of the number of star funds to the number of funds in the family.

		High Support	
	1990 - 2014	1990 - 2002	2003 - 2014
	(1)	(2)	(3)
Family Alpha	2.986**	3.786**	1.470
	(2.23)	(2.18)	(0.74)
Family Alpha$_{t-3,t-1}$	0.225	-0.753	0.184
	(0.28)	(-0.59)	(0.17)
Family Size$_{t-1}$	0.378***	0.317***	0.404***
	(14.41)	(5.96)	(13.28)
Family Expense	7.535**	8.258	7.323*
	(2.18)	(1.45)	(1.69)
Family Turnover	0.0459	-0.000642	0.0414
	(0.71)	(-0.01)	(0.47)
Inst Share	-0.0174	-0.128	0.00635
	(-0.17)	(-0.65)	(0.05)
Outsourced	0.0321	-0.147*	0.106*
	(0.69)	(-1.90)	(1.90)
Number of Funds	-0.00119	-0.0141*	0.000543
	(-0.41)	(-1.94)	(0.17)
Distinct Style	0.538***	-0.153	0.720***
	(3.11)	(-0.42)	(3.58)
Star Portion	-0.686***	-0.308	-0.811***
	(-4.77)	(-1.16)	(-4.53)
Constant	-4.952***	-3.816***	-5.325***
	(-15.14)	(-5.98)	(-13.70)
N	7237	1894	5343
Pseudo R^2	0.07	0.06	0.08
Wald χ^2	432.09	90.06	371.06

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 15
Alternative Explanations

The table studies alternative explanations for fund managers' *Holding Support* behavior. All funds are sorted by their past-year Carhart 4-factor alphas into quintiles, and a fund is coded as a star fund if its past-year alpha is in the top quintile. The sample includes all non-star funds in the fund family. The Dependent variable in all specifications is the fund's next quarter inflow. The construction of various measures of *Holding Support* can be found in Table A1 and in Section 4.5. $Carhart\ Alpha_t$ is the quarterly net alpha estimated using a 24-month rolling regression of monthly net return on Carhart (1997) 4 factors. $Star\ Flow_{t+1}$ is the weighted next quarter inflow of star funds in the family. $Winner\ Prop_{i,t}$ is the proportion of winner stocks held by fund i at the end of quarter t. $Loser\ Prop_{i,t}$ is the proportion of loser stocks held by fund i at the end of quarter t. Winner (loser) stocks are the top (bottom) quintile stocks sorted by the past quarter performance. $Star\ Alpha_{i,t}$ is the star fund performance. $Manager\ Skill_{t-1}$ is the lag of 12-month moving average of return gap defined in Kacperczyk et al. (2008). *Fund Expense* and *Fund Turnover* are the fund level annual expense ratio and turnover ratio from CRSP, respectively. *Family Expense* and *Family Turnover* are the size weighted expense ratio, and turnover ratio of all funds in the fund family, excluding the fund itself, respectively. *Family Size* is the natural logarithm of the fund family's TNA, excluding the fund itself. All specifications include time, style, and family fixed effects, and all standard errors are two-way clustered at time and family level.

	$\%\ Flow_{t+1}$			
	(1)	(2)	(3)	(4)
$HS^{Lag\ Net\ Purchase}$	1.406***		1.489***	
	(3.43)		(3.44)	
$HS^{Cross\ Trading}$		-0.273	0.156	
		(-1.18)	(0.53)	
$HS^{Outside\ the\ Family}$				1.504
				(1.26)
Carhart Alpha	0.289***	0.287***	0.289***	0.287***
	(6.60)	(6.53)	(6.58)	(6.48)
$Star\ Flow_{t+1}$	0.153***	0.153***	0.153***	0.154***
	(6.19)	(6.21)	(6.19)	(6.24)
Winner Prop	0.00538	0.00581	0.00532	0.00496
	(0.35)	(0.37)	(0.34)	(0.32)
Loser Prop	-0.0419***	-0.0425***	-0.0419***	-0.0419***
	(-3.32)	(-3.40)	(-3.32)	(-3.39)
Star Alpha	-0.0146	-0.0140	-0.0145	-0.0129
	(-0.52)	(-0.50)	(-0.51)	(-0.46)
$Manager\ Skill_{t-1}$	0.0455	0.0466	0.0455	0.0458
	(1.31)	(1.35)	(1.31)	(1.34)
Fund Expense	-2.385***	-2.382***	-2.385***	-2.370***
	(-4.44)	(-4.44)	(-4.44)	(-4.38)
Fund Turnover	0.00163	0.00158	0.00162	0.00156
	(0.47)	(0.45)	(0.46)	(0.45)
Fund Size	-0.00591***	-0.00588***	-0.00591***	-0.00590***
	(-3.71)	(-3.71)	(-3.72)	(-3.72)
Family Size	-0.0139*	-0.0138*	-0.0139*	-0.0138*
	(-1.80)	(-1.79)	(-1.80)	(-1.79)
Family Expense	-0.511	-0.513	-0.509	-0.512
	(-0.85)	(-0.85)	(-0.85)	(-0.85)
Family Turnover	-0.00723	-0.00720	-0.00720	-0.00713
	(-1.11)	(-1.11)	(-1.11)	(-1.10)
Time and Style Fixed Effects	Yes	Yes	Yes	Yes
Family Fixed Effects	Yes	Yes	Yes	Yes
N	25455	25455	25455	25455
Adjusted R^2	0.0811	0.0806	0.0811	0.0807
F	17.83	15.37	17.40	15.40

t statistics in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 16
Do Pumping Managers Outperform?

This table studies the performance of non-star funds in the next quarter. In Panel A, all non-star funds are double sorted by past year aggregated alpha and *Holding Support*$^{Net\ Purchase}$ into 5-by-5 quintiles at each quarter end. In Panel B, all non-star funds are double sorted by past year aggregated alpha and *Holding Support*$^{Invisible\ Net\ Purchase}$ into 5-by-5 quintiles at each quarter end. In Panel C, all non-star funds are double sorted by past year aggregated alpha and *Holding Support*$^{Lag\ Net\ Purchase}$ into 5-by-5 quintiles at each quarter end. The mean alpha of funds in the next quarter is reported in percent.

Panel A: Double Sort on *Holding Support*$^{Net\ Purchase}$ and *Carhart Alpha*

$Q_{HS} \backslash Q_{Carhart\ Alpha}$	1	2	3	4	5	L/S
1	-0.140	0.051	0.189	0.331	0.306	0.446
	(-2.23)	(0.80)	(2.80)	(4.77)	(4.48)	(4.81)
2	-0.006	0.098	0.239	0.336	0.325	0.331
	(-0.11)	(1.66)	(3.93)	(5.44)	(5.08)	(3.91)
3	-0.859	0.107	0.259	0.236	0.401	1.260
	(-9.55)	(1.19)	(2.97)	(2.69)	(4.34)	(9.77)
4	-0.231	0.192	0.141	0.331	0.469	0.700
	(-3.08)	(2.67)	(2.09)	(5.10)	(7.02)	(6.98)
5	0.145	0.197	0.118	0.124	0.202	0.056
	(1.86)	(2.76)	(1.71)	(1.84)	(3.18)	(0.56)
L/S	0.285	0.147	-0.071	-0.207	-0.104	
	(2.85)	(1.54)	(-0.73)	(-2.14)	(-1.12)	

Panel B: Double Sort on *Holding Support*$^{Invisible\ Net\ Purchase}$ and *Carhart Alpha*

$Q_{HS} \backslash Q_{Carhart\ Alpha}$	1	2	3	4	5	L/S
1	-0.195	0.076	0.228	0.335	0.347	0.543
	(-3.13)	(1.22)	(3.37)	(4.83)	(5.05)	(5.84)
2	-0.032	0.016	0.187	0.232	0.285	0.317
	(-0.60)	(0.27)	(3.15)	(3.85)	(4.59)	(3.86)
3	-0.651	0.129	0.294	0.403	0.478	1.129
	(-6.42)	(1.34)	(3.16)	(4.36)	(4.83)	(7.97)
4	-0.310	0.335	0.220	0.330	0.429	0.739
	(-4.08)	(4.67)	(3.25)	(5.06)	(6.54)	(7.36)
5	0.100	0.142	0.051	0.158	0.210	0.110
	(1.32)	(1.95)	(0.74)	(2.35)	(3.28)	(1.11)
L/S	0.296	0.066	-0.177	-0.177	-0.137	
	(3.01)	(0.68)	(-1.84)	(-1.83)	(-1.46)	

Panel C: Double Sort on *Holding Support*$^{Lag\ Net\ Purchase}$ and *Carhart Alpha*

$Q_{HS} \backslash Q_{Carhart\ Alpha}$	1	2	3	4	5	L/S
1	-0.341	0.024	0.178	0.253	0.323	0.664
	(-3.13)	(1.22)	(3.37)	(4.83)	(5.05)	(7.32)
2	0.023	0.111	0.201	0.401	0.449	0.425
	(-0.60)	(0.27)	(3.15)	(3.85)	(4.59)	(5.25)
3	-0.279	0.183	0.231	0.228	0.081	0.360
	(-6.42)	(1.34)	(3.16)	(4.36)	(4.83)	(3.11)
4	-0.269	0.210	0.215	0.193	0.344	0.613
	(-4.08)	(4.67)	(3.25)	(5.06)	(6.54)	(5.07)
5	-0.020	0.173	0.122	0.232	0.325	0.346
	(1.32)	(1.95)	(0.74)	(2.35)	(3.28)	(3.48)
L/S	0.321	0.149	-0.055	-0.021	0.002	
	(3.24)	(1.57)	(-0.58)	(-0.22)	(0.03)	

t statistics in parentheses

Table 17
What Stocks do They Pump?

This table studies the characteristics of the stocks that families choose to pump. All funds are sorted by past 11-month performance into quintiles. Funds in the top performance quintile are coded as star funds. For fund family k and stock s in quarter t, I aggregate the portfolio holdings of all star funds, $Star\ Holding_{k,s,t}$, and compute the $Star\ Weighting_{k,s,t}$ as the weighted value of holding of stock s. Then for each stock s and each fund family k, I calculate the dollar amount of the net purchase, $Dollar\ Net\ Purchase_{k,s,t} = P_{l,t} \sum_{i \in I_k} (Holding_{i,k,s,t} - Holding_{i,k,s,t-1})$, where the set I_k contains all non-star funds in the family k. I then aggregate the net purchase to the stock level, $Weighted\ Net\ Purchase_{s,t} = \sum_k (Dollar\ Net\ Purchase_{k,s,t} \cdot Star\ Weighting_{k,s,t})$.
Stocks are sorted by $Weighted\ Net\ Purchase_{s,t}$ into quintiles at each quarter end t, and are held throughout the quarter $t+1$ with equal weighting. Portfolio returns are regressed on Carhart (1997) four factors, and factor loadings are reported.

	Alpha	$R_M - R_f$	SMB	HML	UMD
Low Net Purchase	0.046	1.079	0.311	0.040	-0.050
Q_1	(0.44)	(44.34)	(8.86)	(1.11)	(-2.23)
Q_2	0.143	1.069	0.647	0.190	-0.173
	(1.12)	(34.45)	(15.65)	(4.43)	(-6.38)
Q_3	0.310	1.077	0.713	0.108	-0.192
	(2.04)	(30.19)	(14.32)	(2.08)	(-5.92)
Q_4	-0.115	1.182	0.421	-0.042	-0.023
	(-0.68)	(29.69)	(7.46)	(-0.72)	(-0.61)
Q_5	0.109	1.129	0.322	-0.027	0.002
High Net Purchase	(1.00)	(44.40)	(8.95)	(-0.73)	(0.10)

t statistics in parentheses

Appendices

Figure A1
Snapshot of Vanguard U.S. Growth Fund
The figure is a snapshot of Vanguard U.S. Growth Fund web page. It discloses the top ten largest equity holdings as of August 31, 2016.

Portfolio composition

Equity sector diversification

	U.S. Growth Fund Investor as of 08/31/2016	**Russell 1000 Growth Index as of 06/30/2016**
Consumer Discretionary	19.20%	20.90%
Consumer Staples	5.60%	10.60%
Energy	0.50%	0.60%
Financials	9.20%	5.70%
Health Care	17.60%	17.10%
Industrials	7.80%	10.80%
Information Technology	36.80%	29.30%
Materials	1.00%	3.60%
Other	1.80%	—
Telecommunication Services	0.40%	1.30%
Utilities	0.10%	0.10%

Sector categories are based on the Global Industry Classification Standard system.

Characteristics as of 08/31/2016

Number of stocks	159
Fund total net assets	$6.9 billion
Net assets of ten largest holdings	30.4%
Foreign holdings	1.4%

Month-end ten largest holdings
(30.4% of total net assets) as of 08/31/2016

1	Alphabet Inc.
2	Facebook Inc.
3	Amazon.com Inc.
4	Visa Inc.
5	MasterCard Inc.
6	Microsoft Corp.
7	Allergan plc
8	Celgene Corp.
9	PayPal Holdings Inc.
10	Biogen Inc.

Portfolio holdings may exclude any temporary cash investments and equity index products.

Table A1
Summary Statistics of Holding Support

This table shows the summary statistics of various measures for *Holding Support*.
Holding Support$^{Net\ Purchase}$ is the sum of products between the net purchase of each stock made by the fund, and the holding weight of the corresponding stock in star funds' portfolio in the fund family (see detailed construction in Equation (5)).
Holding Support$^{Visible\ Net\ Purchase}$ is the sum of products between the net purchase of each stock made by the fund, and the holding weight of the corresponding stock in star funds' portfolio in the fund family, where the stocks are in the top ten holding list of the star funds in the family.
Holding Support$^{Invisible\ Net\ Purchase}$ is the sum of products between the net purchase of each stock made by the fund, and the holding weight of the corresponding stock in star funds' portfolio in the fund family, where the stocks are not in the top ten holding list of the star funds in the family.
Holding Support$^{Lag\ Net\ Purchase}$ is the sum of products between the net purchase of each stock made by the fund, and the holding weight of the corresponding stock in star funds' portfolio in the fund family, where the holding weight is calculated using the holding data of the star funds in the previous quarter.
Holding Support$^{Cross\ Trading}$ is the sum of products between the net purchase of each stock made by the fund, and the net purchase of the corresponding stock in star funds' portfolio in the fund family.
Holding Support$^{Outside\ Family}$ is the sum of products between the net purchase of each stock made by the fund, and the holding weight of the corresponding stock in the aggregated portfolio of all star funds outside the family.

Variable	Obs	Mean	Std. Dev.	Min	Max
$HS^{Net\ Purchase}$	50599	0.0005	0.0027	-0.1365	0.1138
$HS^{Visible\ Net\ Purchase}$	50599	0.0003	0.0021	-0.0791	0.1137
$HS^{Invisible\ Net\ Purchase}$	50599	0.0002	0.0009	-0.0574	0.0195
$HS^{Lag\ Net\ Purchase}$	50599	0.0001	0.0024	-0.1824	0.0817
$HS^{Cross\ Trade}$	50599	0.0002	0.0198	-20.2967	0.358
$HS^{Outside\ the\ Family}$	50599	0.0003	0.0012	-0.0768	0.0292

Table A2

Correlation Matrix of Holding Support

This table shows the correlation matrix of various measures for *Holding Support*.

$Holding\ Support^{Net\ Purchase}$ is the sum of products between the net purchase of each stock made by the fund, and the holding weight of the corresponding stock in star funds' portfolio in the fund family (see detailed construction in Equation (5)).

$Holding\ Support^{Visible\ Net\ Purchase}$ is the sum of products between the net purchase of each stock made by the fund, and the holding weight of the corresponding stock in star funds' portfolio in the fund family, where the stocks are in the top ten holding list of the star funds in the family.

$Holding\ Support^{Invisible\ Net\ Purchase}$ is the sum of products between the net purchase of each stock made by the fund, and the holding weight of the corresponding stock in star funds' portfolio in the fund family, where the stocks are not in the top ten holding list of the star funds in the family.

$Holding\ Support^{Lag\ Net\ Purchase}$ is the sum of products between the net purchase of each stock made by the fund, and the holding weight of the corresponding stock in star funds' portfolio in the fund family, where the holding weight is calculated using the holding data of the star funds in the previous quarter.

$Holding\ Support^{Cross\ Trade}$ is the sum of products between the net purchase of each stock made by the fund, and the net purchase of the corresponding stock in star funds' portfolio in the fund family.

$Holding\ Support^{Outside\ Family}$ is the sum of products between the net purchase of each stock made by the fund, and the holding weight of the corresponding stock in the aggregated portfolio of all star funds outside the family.

Variables	$HS^{Net\ Purchase}$	$HS^{Visible\ Net\ Purchase}$	$HS^{Invisible\ Net\ Purchase}$	$HS^{Lag\ Net\ Purchase}$	$HS^{Cross\ Trading}$	$HS^{Outside\ the\ Family}$
$HS^{Net\ Purchase}$	1.000					
$HS^{Visible\ Net\ Purchase}$	0.663	1.000				
$HS^{Invisible\ Net\ Purchase}$	0.735	0.525	1.000			
$HS^{Lag\ Net\ Purchase}$	0.461	0.425	0.388	1.000		
$HS^{Cross\ Trading}$	0.076	0.078	0.046	-0.123	1.000	
$HS^{Outside\ the\ Family}$	0.160	0.127	0.185	0.178	-0.055	1.000