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 quarter end. Star funds with high family pumping activities show strong evidence of inflated performance only after 2002, when the Securities and Exchange Commission increased regulation on portfolio pumping at the fund level. Stocks pumped by the strategy show strong reversals at the last trading day of the quarter. Non-star fund managers pumping for star funds receive substantially higher inflows in the future, which cannot be explained by fund characteristics.

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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 the calendar year-end. Carhart, Kaniel, Musto, and Reed (2002) document the inflated net asset values (NAVs) of the mutual fund indices, and they 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.

Since 2002, it has become risky for star fund managers to pump portfolios themselves under the watch of the Securities and Exchange Commission (Burns (2001)), and fund level pumping decreases (Duong and Meschke (2015)). Do mutual fund families cease pumping, or find alternative ways to manipulate star fund performance? The aim of this paper is to determine whether there is a workaround where mutual fund families can bypass regulators and continue to manipulate the market. To the best of my knowledge, this paper is the first to study a family-level pumping strategy, where non-star fund managers pump stocks held by star funds in the family to drive up stock prices and inflate star funds' performance. Pumping at the family level requires non-star fund managers to execute the trade, while star funds benefit from the price impact. Therefore, it is less risky than, but as effective as, the fund-level pumping strategy.

The rationale for fund families to engage in portfolio pumping at the 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, non-star fund managers have incentive to pump for the star funds. Recent studies of mutual funds show that the compensation of a mutual fund manager depends on individual performance and family size. Family size plays a crucial role in determining compensation when the manager's performance is not at the top (Ma, Tang, and Gómez (2015), and Ibert, Kaniel, Van Nieuwerburgh, and Vestman (2017)).

In sum, pumping at the family level is subtler and less likely to be detected by regulators than at the fund level. However, it generates misleadingly high returns for star fund investors, and creates agency problems for non-star fund investors. Therefore, testing the existence of family level pumping is important from the perspectives of regulators and investors. Using mutual fund holding data, advertising data, and stock intraday trading data, I find that mutual fund families find loopholes in the legal system, bypass regulators to inflate their star fund performance, and continue to manipulate the market. Fund-level pumping activity falls, whereas family-level pumping activity rises after 2002. Star funds with high family-level pumping activity show a significant performance reversal of over 40 basis points at quarter ends, but there is no performance reversal for star funds with low family-level pumping activity. Moreover, the inflated performance is driven by spikes in prices of the pumped stocks, which further supports my findings. Mutual fund families subsidize non-star fund managers for pumping star funds. Pumping managers receive substantially more future inflows, despite their short-term portfolio distortions. Pumping managers also receive more advertising opportunities subsequently, which could explain the abnormal inflows they receive.

The result of this paper can be summarized as follows. First, this paper finds evidence of portfolio pumping at the 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. Before 2002, the more individual fund-level pumping activities there are, 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 indicates that mutual fund families shifted their pumping strategy from fund level to family level when the SEC increased its attention.

Second, I use stock-level data to show that the inflated performance of star funds is indeed driven by the outperformance of the pumped stocks. I create a long/short portfolio of stocks by buying stocks pumped the most and selling stocks pumped the least by non-star funds at quarter end. Using an event study approach, I find that the cumulative return of the long/short portfolio spikes at quarter end, and quickly reverses back in the next trading days. The magnitude of inflation at the stock level is consistent with the fund-level evidence. Moreover, the result is robust to alternative measures such as CAPM and Fama French four-factor alphas. Furthermore, I use Trade and Quote (TAQ) intraday data and find that, stocks that are most likely to be pumped by the family strategy show strong returns in the last trading day of the quarter, especially in the last 30 minutes. Therefore, the results indicate that the fund-level reversals at quarter end are driven by the family pumping activity.

Third, do fund families strategically choose stocks to pump? When making the family pumping decision, fund families face a tradeoff. Pumping top-listed stocks can be very efficient, as these stocks constitute a large weight in the total holdings. However, pumping top-listed stocks can be risky, as these stocks draw more attention from regulators and competitors. To test the trade-off, I construct visible and invisible pumping measures, depending on whether the stock pumped is in the top-10 holding list of star funds. The result shows that only star funds with high invisible pumping show performance inflation at quarter ends. These fund families tend to pump stocks buried deep down in the book of star funds. Moreover, fund families select stocks to pump, so that the price impact resulting from the family-level pumping only boosts the in-family star funds but not their competitors outside the family.

Fourth, pumping for the family is not optimal for non-star fund managers, as it incurs portfolio distortions. Then what are their incentives to do so? Pumping managers receive more future inflows than non-pumping ones, despite their underperformance. Specifically, non-star managers in the top quintile of pumping activity receive 1.97% ($20 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 0.44%. In a panel regression approach, I further show that pumping managers receive more inflows than non-pumping managers within a fund family, after controlling for fund performance, spillover effect, and family fixed effects.

As inflows come from investors, how do mutual fund families affect investors' investment decisions and direct flows to pumping managers? This paper proposes two channels. First, the family manager advertises more for pumping funds, thus redirecting flows to pumping funds. Although investors make investment decisions, salespeople and financial advisors in the family can persuade investors to invest in pumping funds to compensate pumping manager's effort. Gallaher, Kaniel, and Starks (2015) document that the fund family makes all the advertising decisions, and advertising expenditure has a significant positive effect on fund inflows. Second, families can redirect flows to pumping funds through the fund of funds. Families can increase the holding of pumping funds in the fund of funds, so that there are positive and substantial inflows to the pumping funds. This paper finds that both institutional and retail inflows are positively correlated with managers' past pumping activity. Using a small sample of funds with advertisement data, I find that funds with high pumping activity are more likely to be advertised exclusively on the print media, which supports the advertising channel.

Last, 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), who note that families try hard to generate star funds. The evidence of portfolio pumping at the 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 the family level if they share at least one common manager with star funds, since a common manager knows which stocks are the most effective to pump.

The remainder of the paper is organized as follows. Section 2 discusses the data and the construction of key variables. Section 3 shows the empirical results, and Section 4 concludes.

2 Data and variable construction

2.1 Sample selection

I use the Center for Research in Security Prices (CRSP) Mutual Fund database, Thomson Reuters Mutual Fund database, and MorningStar Direct (MS) to construct the data. I also use TAQ data to get intraday returns. Advertising data are obtained from Kaniel and Parham (2017).

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. The 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. MS provides mutual fund overall ratings from 1986.

Because the 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

[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.

turnover ratios. Portfolio holding data from CRSP and Thomson Reuters are at the fund level. I then merge the Thomson Reuters and CRSP using the MFLink identifier *wficn*.

I also use 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. Because CRSP does not provide detailed portfolio manager names[3], I merge CRSP with MS to get star ratings and detailed manager histories[4].

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, and I exclude balanced, bond, international, money market, and sector funds.

2.2 Holding based measures of portfolio pumping

A family manager can pump a portfolio of star funds in two ways. Either non-star fund managers buy stocks held by star funds at quarter ends to inflate star fund performance or star fund managers do it themselves. To measure the portfolio pumping inside the family, I construct variables *Family Pumping* and *Fund Pumping*. *Family Pumping* quantifies the magnitude of pumping activity by non-star fund managers in the family, whereas *Fund Pumping* measures the magnitude of pumping activity by star fund managers themselves.

All funds are sorted by their past 12-month performance (excluding the most recent month) into quintiles in each quarter. Funds that are in the top quintile[5] are coded as the

[3]In the 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.

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

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 $Star\ Holding_{k,s,t}$. For example, suppose there are two star funds in family k at quarter t, each holding 100 shares of stock s. Then $Star\ Holding_{k,s,t}$ is 200. I then compute the weight of stock s in the aggregated star portfolios, and denote it as $w^{Star}_{k,s,t}$,

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

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. Aggregating all star funds in the family is not the only way to construct the pumping measure, as one can treat each star fund as a potential pumping target. Consider the case where a family decides to pump the stock "XYZ", which is held by star funds "A" and "B". It is not clear which star funds the family is targeting. Therefore, grouping star funds in the family is a more conservative approach to measure the family-level pumping[7].

For family k, stock s, and time t, I aggregate the number of shares purchased by non-star fund managers in the family, normalize it by the trading volume of stock s, and denote it as $Shares\ Purchased^{Non-star}_{k,s,t}$. Normalizing the number of shares purchased by the trading volume[8] is necessary, since the price impacts generated by the pumping from non-star funds depend on the liquidity of the stock. It can be viewed as the trading pressure imposed by the family. The potential benefit received by the star funds in the family, $Family\ Pumping_{k,t}$ is the weighted $Shares\ Purchased^{Non-star}_{k,s,t}$. The weights depend on the last quarter holding

funds.

[6] Note that by construction, some mutual fund families may not have any star funds. In this case, I code the top performing funds in these families as star funds, so that all fund families are kept in the analysis. However, all the empirical results, available upon request, do not qualitatively change, if I drop families without any star funds.

[7] The result is robust if each star fund in the family is treated as the potential target.

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

of the star fund portfolio.

$$Shares\ Purchased^{Non-star}_{k,s,t} = \sum_{i \in I_{k,t}} \frac{\max(Holding_{i,k,s,t} - Holding_{i,k,s,t-1}, 0)}{Vol_{s,t}}, \tag{2}$$

$$Family\ Pumping_{k,t} = \sum_{s} Shares\ Purchased^{Non-star}_{k,s,t} \cdot w^{Star}_{k,s,t-1}, \tag{3}$$

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. Using the one quarter lag of stock weights in star funds is to avoid any potential looking ahead bias. The result does not change qualitatively if the current quarter weights are used.

The construction of *Fund Pumping* is very similar to *Family Pumping*, except that it captures the purchase made by the star fund managers instead of the non-star fund managers.

$$Fund\ Pumping_{k,t} = \sum_{s} Shares\ Purchased^{Star}_{k,s,t} \cdot w^{Star}_{k,s,t-1}, \tag{4}$$

where $Shares\ Purchased^{Star}_{k,s,t}$ is the number of shares purchased by star fund managers in family k, normalized by the trading volume of stock s.

2.3 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 the following fund flows[9]:

$$\%\ flow_t = [TNA_t - TNA_{t-1} \cdot (1 + r_t)]/TNA_{t-1} \tag{5}$$

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

[9] I also use the alternative 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. 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, Gay, and Ling (2014). *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 fund i at quarter t. $Loser\ Prop_{i,t}$ 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. Window dressing funds tend to hold winner stocks and sell loser stocks at quarter ends, so that the disclosed portfolio looks attractive to investors. *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 $mgmt\_name_{i,t}$ 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 $mgmt\_cd_{i,t}$ with $mgmt\_cd_{j,t}$. If both $mgmt\_name_{i,t}$ and $mgmt\_cd_{i,t}$ 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.

3 Empirical results

3.1 Convex fund flows and the 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 *Top Fund*$_{i,t}$ if it is in the top performance quintile at quarter t. Fund i is categorized as a *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 *Star Family*$_{i,t}$ if at least one other fund in fund i's family is in the top performance quintile. *Star Alpha*$_{i,t}$ is the quarterly alpha of the top performing fund other than fund i itself in the family. *Fund Size*$_{i,t}$ is the log transformation of fund i's TNA at quarter t. *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, *Carhart Alpha*^{2}. Similar to the findings of Sirri and Tufano (1998), there is a convex relationship between flows and past performance. Columns (4) and (5) add family characteristics and report the spillover effect of the star funds. The coefficient estimates of *Star Family*$_{i,t}$ are positive and highly significant. Being in a star family increases a fund's next quarter percent flow by 0.44%. Meanwhile, the coefficient estimate of *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).

3.2 Portfolio pumping at family level

Carhart et al. (2002) document portfolio pumping of mutual funds and find that star fund managers pump 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 the 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 3.1). Moreover, non-star funds in the family benefit from the spillover effect because of the superior performance of their star funds.

3.2.1 The fall of fund-level pumping

To test the fund-level pumping, I construct the variable *Fund Pumping* in equation (4). I then sort star funds by *Fund Pumping* into deciles and form 10 equal-weighted portfolios. For each portfolio, I regress its daily return net of the market on a set of time dummies that indicate the beginning and end of quarters and months.

$$R_t = b_0 + b_1 Quarter\ End_t + b_2 Quarter\ Beginning + b_3 Month\ End_t + b_4 Month\ Beginning_t + \epsilon_t, \quad (6)$$

where *Quarter End* equals one if it is the last trading day of March, June, September, or December. The dummy *Quarter Beginning* equals one if it is the next trading day. *Month End* equals one if it is the last trading day of the month (excluding quarter ends), and *Month Beginning* equals one if it is the next trading day. The coefficient estimates b_1 and b_2 then capture average excess returns at quarter ends and beginnings. Finally, I plot the turn of quarter coefficient estimates and their confidence intervals in Figure 1.

Figure 1(a) shows the performance reversals before 2002. Graphically, performance inflation can be viewed as the spread between the top and the bottom bars. The spread widens, and performance inflation increases, as we move from the bottom to the top decile of *Fund Pumping*. Taking the top decile portfolio of *Fund Pumping* as an example, the average excess returns are about 40 basis points and -20 basis points at quarter end and beginning, respectively. Both estimates are significant at 5% level. Importantly, the finding of portfolio pumping at fund level alleviates concerns of the pumping measures used in the paper. Even though the pumping measures are constructed using quarterly holding data, they can capture pumping activity.

After 2002, as shown in Figure 1(b), there are no significant reversal patterns when we sort funds by *Fund Pumping*, which is consistent with the increased regulatory pressure on portfolio pumping, and star fund managers become reluctant to pump portfolios themselves.

3.2.2 The rise of family-level pumping

Although it becomes risky and costly for star fund managers to pump portfolios, fund families could take a detour and pump their star funds at the expense of non-star funds. To test this hypothesis, I sort star funds by *Family Pumping* (see equation (3)) into deciles and form 10 equal-weighted portfolios. Similar to the approach in Figure 1, I regress the daily excess return of each portfolio on the same set of dummies in equation (6) and plot the 95% confidence interval of the turn-of-quarter dummies in Figure 2.

As shown in Figure 2(b), the spread between excess returns at quarter end and beginning widens as *Family Pumping* increases. That is, star funds with high family-level pumping activity show significant performance inflation. Note that Figures 1(b) and 2(b) have the same set of star funds and the same date range. Sorting star funds by *Family Pumping* exhibits performance inflation at quarter ends, but sorting star funds by *Fund Pumping* does not. The difference suggests that fund families have shifted their pumping strategy from fund level to family level. Pumping at the 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.

In the pre-2002 sample, almost all 10 portfolios show performance inflation, and the magnitude of the inflation does not increase with the level of *Family Pumping*. Before 2002 when there is little attention to pumping, mutual fund families do not need to employ the strategy of family-level pumping to inflate star fund performance, as star fund managers can simply pump portfolios themselves.

In summary, the decrease of portfolio pumping at fund-level is consistent with closer attention by regulators and the media. While fund-level pumping falls, family-level pumping rises in response to the increased regulatory 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.

3.2.3 Stock-level evidence of family pumping

This section shows stock-level evidence of the family pumping strategy employed by mutual fund families. Stocks pumped the most by non-star fund managers should show higher (abnormal) returns than stocks pumped the least at the end of quarters, following a reversal in the next couple of trading days.

To test the hypothesis, I sort stocks by *Pumping Pressure* defined in equation (7), which is the aggregated $\textit{Shares Purchased}^{Non-star}$ across all families. Stocks ranked in the top *Pumping Pressure* quintile are the ones pumped the most by non-star fund managers across families. I then form a long/short portfolio of stocks by buying stocks in the top quintile and selling stocks in the bottom quintiles after 2002, and evaluate the performance of the portfolio using an event-study approach with a (-7,7) trading window around the quarter end.

$$Pumping\ Pressure_{s,t} = \sum_{k} Shares\ Purchased^{Non-star}_{k,s,t} \cdot w^{star}_{k,s,t-1}, \qquad (7)$$

where k, s, and t represent fund family, stock, and time, respectively.

In Figure 3, the solid red line represents the average cumulative return of the long/short portfolio. The dashed blue line represents the average cumulative abnormal return based on CAPM model. The dotted green line represents the average cumulative abnormal return based on the Fama French four-factors. The factor loadings are estimated over the half-year trading window before each quarter end.

The cumulative return of the long/short portfolio takes a sharp increase of over 20 basis points right at quarter end and then a decrease of 15 basis points the next day, following a gradual decrease in the next three days. The magnitude of the stock-level reversals is consistent with the one in the fund level in Figure 2. The star funds in top-two *Family Pumping* deciles show inflation of around 20 basis points at quarter end, following a 10-basis-point decline at the quarter beginning. Regarding alpha, both blue and green lines show a result similar to the red line of raw return.

Table 4 shows fundamental characteristics and factor loadings of stocks by *Pumping Pressure* quintiles. Panel A reports the summary statistics of fundamental characteristics by quintiles. Stocks in the top quintile are smaller in total assets and market equity value than stocks in the bottom quintile. For example, the average market cap in the bottom quintile is \$6.5 million, and it is \$3.6 million in the top quintile. The difference is significant at a 1% level. Moreover, stocks in the top quintile also earn a 1.68% lower annual return than stocks in the bottom on average.

In Figure 4, I examine the intra-day return of stocks in each *Pumping Pressure* quintile at the last trading day of each quarter. The horizontal axis is the time of the day at quarter end, and the vertical axis is the average cumulative return in basis points. As we can see, stocks with the highest pumping pressure from mutual fund families show strong intra-day returns, consistent with Figure 3. Moreover, the return of the highest pumping pressure stocks spikes in the last 30 minutes of the quarter, which supports the pumping hypothesis that non-star fund managers drive up stocks held by star funds in the family at quarter end.

3.2.4 Visible versus invisible pumping

This section takes a deeper look at family-level pumping, and splits the measure *Family Pumping* into two measures, *Visible Pumping* and *Invisible Pumping*, depending on whether the stocks pumped are in the top-10 holding list of star funds. I choose the top-10 list because mutual funds typically disclose their 10 largest holdings on their website at the end of the month. As shown in Figure A1, BlackRock Advantage U.S. Total Market Fund discloses its top-10 portfolio holdings at the end of August 2018.

$$Visible\ Pumping_{k,t} = \sum_{s} Top_{k,s,t-1} \cdot Shares\ Purchased^{Non-star}_{k,s,t} \cdot w^{Star}_{k,s,t-1}, \tag{8}$$

$$Invisible\ Pumping_{k,t} = \sum_{s} (1 - Top_{k,s,t-1}) \cdot Shares\ Purchased^{Non-star}_{k,s,t} \cdot w^{Star}_{k,s,t-1}, \tag{9}$$

where $Top_{s,k,t-1}$ equals one if stock s is in top-10 holding list of star funds.

It is not clear ex-ante how managers measure the trade-offs between pumping visible and invisible stocks. Pumping stocks outside the top-10 list has several advantages. Pumping stocks outside the list is less noticeable by regulators and competitors than pumping stocks inside the list. Furthermore, stocks outside the top list are more likely to be small and illiquid. Therefore, pumping stocks outside the top list is more likely to have a higher price impact than pumping stocks in the list. However, stocks outside the list have smaller weights than stocks in the list, so the weighted contribution of stocks outside the list to the portfolio return could be smaller.

Figure 5 shows the performance inflation of star funds at the turn of quarters, sorted by *Visible Pumping* and *Invisible Pumping*. Figure 5(b) exhibit a similar pattern with Figure

2(b). Star funds with high *Invisible Pumping* show economically and statistically significant inflation at quarter ends, whereas funds with high *Visible Pumping* show no inflation in Figure 5(a).

3.2.5 Robustness checks: alternative explanations

Cross trading

Gaspar, Massa, and Matos (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 trades can explain the abnormal superior performance of high-value funds.

To rule out the cross-trading explanation, I construct the variable *Cross Trading* to capture the magnitude of cross trading between star and non-star funds in the family. It is the sum of products over all possible stocks between the transactions made by non-star funds and those made by star funds. The transaction made by a fund is the dollar amount of the purchase or sale of a stock, normalized by the fund size.

$$Transaction^{i}_{k,s,t} = \frac{P_{s,t}(Holding^{i}_{k,s,t} - Holding^{i}_{k,s,t-1})}{TNA^{i}_{k,t}} \tag{10}$$

$$Cross\ Trading_{k,t} = -\sum_{s} Transaction^{Non\text{-}star}_{k,s,t} \cdot Transaction^{Star}_{k,s,t}, \tag{11}$$

where k, s, and t denote fund family, stock, and time, respectively. Intuitively, if there is only one stock held by both star and non-star funds, and the two funds cross trade the stock with each other, then the product between transactions made by non-star and star funds is negative, and the whole term *Cross Trading* is positive. Therefore, the measure *Cross Trading* is large and positive when two funds cross trade a large number of shares of stocks with each other, and it is large and negative when two funds trade stocks in the same direction.

Similar to the procedure in Figure 2, star funds are sorted by *Cross Trading* into deciles, and portfolio excess return is regressed under specification in equation (6). Figure 6(a) shows the coefficient estimates and 95% confidence interval of time dummies. For the high *Cross Trading* deciles, there is no significant performance inflation at the turn of quarters. Therefore, 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 a price impact, we should not observe the performance inflation of star funds at the turn of quarters.

Pumping outside family

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 *Outside Family Pumping* to test the hypothesis.

For each family k at time t, I first aggregate the holdings of star funds outside the family k, excluding stocks held by star funds in the family. Second, I calculate the stock weight in the aggregated portfolio, denoted as $w^{Star}_{-k,s,t}$. Third, I calculate *Outside Family Pumping* as the sum of the products over all stocks between the number of shares purchased by non-star funds and the stock weight in the aggregated portfolio.

$$\textit{Outside Family Pumping}_{k,s,t} = \sum_{s} \textit{Shares Purchased}^{\textit{Non-star}}_{k,s,t} \cdot w^{Star}_{-k,s,t-1} \tag{12}$$

Star funds are then sorted by *Outside Family Pumping* into deciles, and portfolio excess returns are regressed under the specification in equation (6). Figure 6(b) shows the coefficient estimates and 95% confidence interval of time dummies. There is no significant performance inflation at the turn of quarters for star funds in the high *Outside Family Pumping* deciles. When we exclude stocks held by the family star funds and their competitors, there is no cross-sectional difference in the turn-of-quarter returns. The result suggests that families target stocks to pump strategically, so that the price impact would not benefit their competitors.

3.3 Do fund managers benefit from portfolio pumping?

The previous section shows that prices of star funds are inflated at quarter ends, but it is important to understand the incentives of the other side of fund families, the pumping non-star funds. In this section, I investigate whether non-star fund managers benefit from pumping portfolios of star funds in the family and the distortion of portfolio allocation due to the pumping. In particular, section 3.3.1 describes the measure to quantify the family-level pumping from the side of non-star managers. Sections 3.3.2 - 3.3.4 show evidence that pumping managers enjoy abnormally high future inflows that cannot be explained by fund and family characteristics, such as performance and spillover effect. Section 3.3.5 documents the portfolio distortion and decreased future performance of pumping managers.

3.3.1 Measuring pumping from the side of non-star managers

To quantify the magnitude of non-star fund managers pumping for star funds in the family, I first construct the variable $Holding\ Support^{Purchase}$ to proxy the pumping effort of non-star fund. From a non-star fund manager's perspective, the capital the manager has put in to pump the family star funds is the most straightforward measure to quantify the pumping effort. For each non-star fund i in family k at quarter t, I calculate the purchase of each stock s, normalized by the total portfolio holding value of fund i at quarter t,

$$Purchase_{i,k,s,t} = P_{s,t} \cdot \frac{\max(Holding_{i,k,s,t} - Holding_{i,k,s,t-1}, 0)}{\sum_{l \in L_{i,t}} P_{l,t} \cdot Holding_{i,k,l,t}}, \tag{13}$$

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.

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

$$Holding\ Support^{Purchase}_{i,k,t} = \sum_{s} w^{Star}_{k,s,t-1} \cdot Purchase_{i,k,s,t} \tag{14}$$

By construction, $Holding\ Support^{Purchase}$ 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.

3.3.2 Flow subsidization for pumping managers: evidence from a double sort

In Panel A of Table 5, non-star funds are double sorted by past-year aggregated alpha and current quarter $Holding\ Support^{Purchase}$ 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 $Holding\ Support^{Purchase}$. 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 more inflows, which is unrelated to fund performance.

However, the finding in Panel A of Table 5 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 assets managed by star funds, *Star_Portion*, in each family. I then double sort funds by *Star_Portion* and $Holding\ Support^{Purchase}$, and report the mean inflows in each quintile in Panel B. Similar to the result in Panel A, the mean inflow strictly increases with $Holding\ Support^{Purchase}$ 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. Table 5 shows that the average difference in future inflows between the top and the bottom quintiles of *Holding Support*^{Purchase} is about 1.8% per quarter, whereas the spillover effect estimated in column (4) of Table 3 is 0.44%.

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.

3.3.3 Visible versus invisible pumping of non-star funds

In this section, I test whether the monotonic relation between *Holding Support*^{Purchase} and future inflow found in Table 5 is driven by the visible or invisible pumping of non-star fund managers. Section 3.2.4 has shown that the inflation of star funds at quarter ends only responds to the invisible pumping by fund families. However, it is not clear whether the inflow of non-star funds also responds to invisible pumping. One explanation for the monotonic relation in Table 5 is that investors pay attention to a disclosed portfolio of star funds and reward non-star funds if they are picking the same set of stocks as star funds. Alternatively, pumping managers enjoy more inflows as the fund family redirects flows to them to compensate their effort.

I decompose the measure of *Holding Support*^{Purchase} into two parts, *Holding Support*^{Visible} and *Holding Support*^{Invisible}.

$$Holding\ Support_{i,k,t}^{Visible} = \sum_{s} Top_{k,s,t-1} \cdot w_{k,s,t-1}^{Star} \cdot Purchase_{i,k,s,t} \tag{15}$$

$$Holding\ Support_{i,k,t}^{Invisible} = \sum_{s} (1 - Top_{k,s,t-1}) \cdot w_{k,s,t-1}^{Star} \cdot Purchase_{i,k,s,t} \tag{16}$$

where w^{Star} and *Purchase* are defined in equation (14). $Top_{k,s,t}$ is equal to one if stock s is among the top-10 largest holdings of star funds in family k at the end of quarter t, and zero otherwise. I then double-sort funds by *Holding Support*^{Visible} (*Holding Support*^{Invisible}) and past year performance into 5×5 quintiles and calculate the mean of next quarter fund inflows in each quintile.

Table 6 reports the result. Only Panel B of Table 6 shows a monotonic relation between future inflows and invisible pumping, consistent with the finding in Figure 5. That is, non-star managers pumping stocks outside the top-10 list of star funds enjoy excess inflows that are unrelated to performance.

3.3.4 Flow subsidization for pumping managers: evidence from multiple regressions

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

$$\%\ Flow_{i,t+1} = \alpha + \beta' Holding\ Support_{i,t} + \gamma' \mathbf{X}_{i,t} + \epsilon_{i,t}, \tag{17}$$

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 result is shown in Table 7. In columns (1) to (3), the coefficient estimates of various *Holding Support* measures are all positive and significant. The significance of visible pumping by non-star funds is not consistent with the results shown in Panel (a) of Table 6, but both the magnitude and t-stat are smaller than invisible pumping.

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. A mutual fund family makes decisions for resource allocations and advertisement. One potential channel is that a 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 the 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 the share class code from CRSP. On one hand, if the advertising channel 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 are. On the other hand, if the result is driven by the fund of funds channel, we should expect that the institutional inflows are correlated with pumping effort. I use the next quarter retail (institutional) flow as the dependent variable, and run the similar regression in equation (17). Table 8 shows the result. Interestingly, the benefit of pumping star funds comes not only from retail inflows, but also from institutional inflows. Therefore, both the advertising channel and the fund of funds channel remain possible.

To further test the advertising channel, I use fund level advertisement data and find that funds with high pumping activity indeed get more advertisements in the next quarter. I achieve fund level advertisement data from Kaniel and Parham (2017). They hand-collected advertisement of mutual fund companies from 2000 to 2012. Advertisements are typically designed to promote the entire complex, but occasionally only a single fund is mentioned in the advertisement. Therefore, for a fund complex to be included in the analysis, I require at least one fund in the complex to be mentioned in the advertisements. After matching and merging with my sample, I have 12 fund companies and 52 distinct mutual funds. I then run a set of logistic regressions. The dependent variable is a dummy variable that is equal to one if the fund is mentioned solely in the advertisement in the next quarter. The independent variable of interest is *HS Top*, which is a dummy variable that equals one if the fund is in the top quintile of *Holding Support*. Table 9 shows the logistic regression results. The coefficient estimate of *HS Top* is positive and significant, which shows that high pumping funds are more likely to get advertisements in the future. Column (2) adds the current quarter *Ad* dummy, and column (3) adds the family and style fixed effects. *HS Top* is only significant at 10% level, which is likely due to the small sample.

3.3.5 Short-term performance distortion of pumping funds

The focus of this section is the short-term and long-term performance of pumping funds. The strategy of family-level pumping alters the asset allocation of pumping funds, and they incur unnecessary transaction costs. As a result, we should see that pumping funds under-perform non-pumping funds at least in the short-term, ceteris paribus.

To test this hypothesis, I first sort non-star funds by previous quarter alpha into quintiles. Conditional on each alpha quintile, funds are then sorted by the level of pumping, $\textit{Holding Support}^{Purchase}$ into quintiles. I then form portfolios of funds for each conditional double-sort block, and test the portfolio performance using Fama French 4 factors.

Panel A of Table 10 shows the short-term performance of pumping funds by holding the funds for one month after the portfolio formation. The average annualized alpha of long/short portfolios is -2.63%, or 22 basis points for one month. The magnitude of the under-performance is consistent with the stock level evidence shown in Figure 3. The result suggests that pumping funds heavily under-perform non-pumping funds in the subsequent month following quarter end.

Panel B of Table 10 shows the long-term performance of pumping funds by extending the one-month holding period to 12 months. The average alpha of the long/short portfolio is 0.1%, and none of the alphas is significant in any performance quintiles. The result suggests that the short-term under-performance in Panel A is not due to the poor manager skills of pumping funds, but is more likely due to the distortion of portfolio allocation.

3.4 What funds and families are more likely to pump star funds?

3.4.1 Evidence at fund level

I study the determinants of portfolio pumping inside the fund families in Table 11. The dependent variable is the dummy *HS Top*, which is equal to one if the fund is sorted by $\textit{Holding Support}^{Purchase}$ into the top quintile. *Common Manager* is a dummy variable that 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 that 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 that 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. 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. Column (3) of Table 11 adds the dummy variable *Fourth Quarter*, and its coefficient estimate is positive and significant. The results suggest that pumping funds are more likely to share a common manager with star funds in the family, and the tendency of pumping is stronger in the fourth quarter, consistent with the literature.

3.4.2 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 strategy of family-level pumping. The second part studies the characteristics of fund families that employ the strategy using logistic regression.

To test whether the heavily pumped mutual fund families before 2002 are the ones that employ the strategy of family-level pumping, 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 Pumping* for families in each tercile and for each year after 2002. The result is shown in Table 12. Families in the top tercile have higher *Family Pumping* in all years, except in 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 strategy of family-level pumping.

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

Table 13 reports the result. The coefficient estimates of *Family Expense* are positive and significant. Expensive fund families have more incentive to pump the portfolio of the star funds, so that they receive more fees from the increased assets under management.

Star Portion is negative and significant. That is, fund families with fewer star funds are more likely to engage in portfolio pumping at the 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 Conclusion

The paper contributes to the portfolio pumping literature. Previous literature focuses on portfolio pumping at the individual fund level. This paper is the first to investigate portfolio pumping at the 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 a 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). In addition, 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 this 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 0.44% per quarter.

The paper is important to regulators because it points out the insufficient regulation of 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 requirements of fund companies. In particular, the paper shows that big families with relatively fewer top-performing funds and high performance inflation before 2002 are more likely to pump star funds at the family level. Regulators should also pay attention to multi-fund 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 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 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 the inflated performance of star funds at quarter end. Moreover, the issue of agency conflict found in the paper is worse than expected 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 to subsidize managers' pumping effort.

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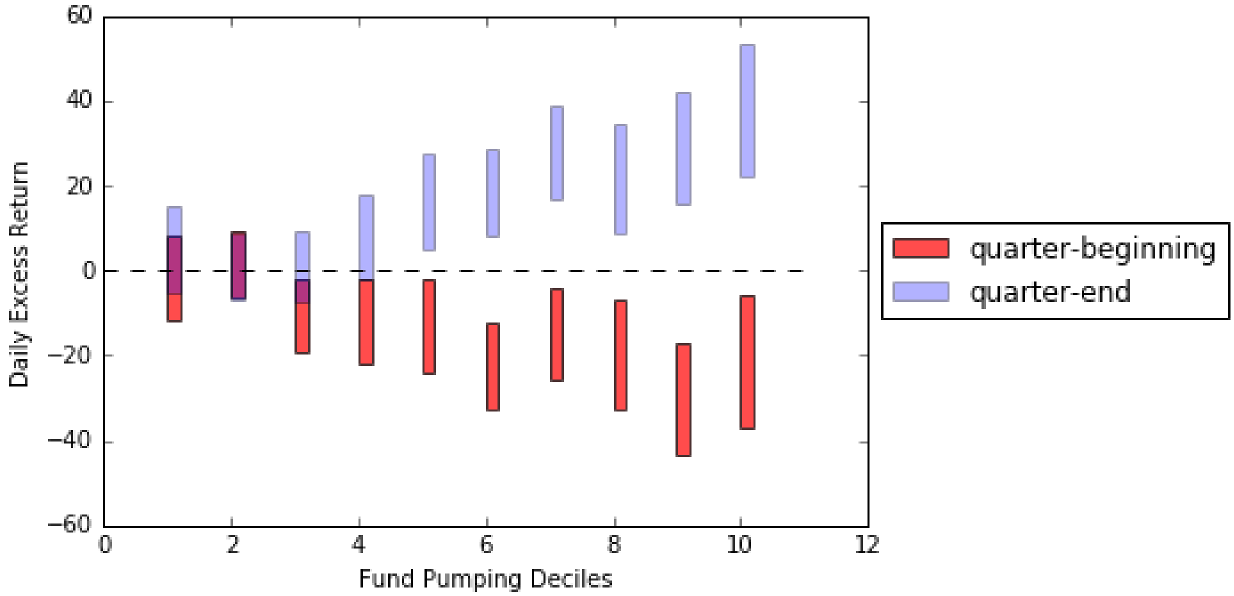
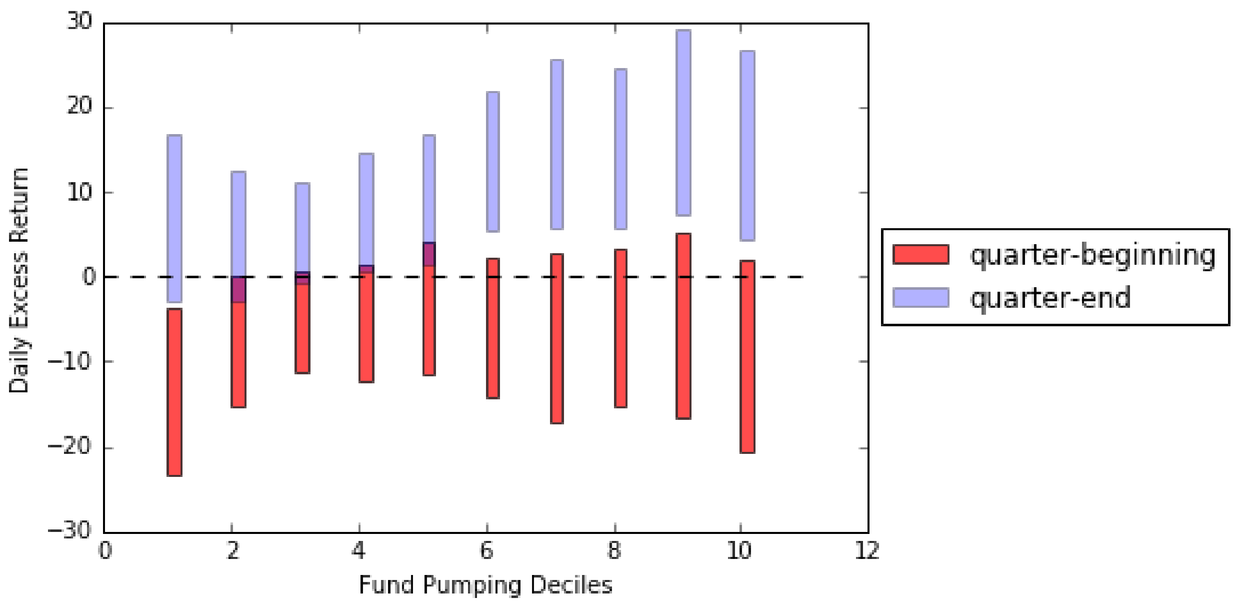
Figure 1

Performance Inflation and Individual Pumping

The figure shows the performance inflation of star funds in mutual fund families at the turn of quarters, sorted by *Fund Support* into deciles. For each decile of *Fund Support*, I construct an equal-weighted portfolio of funds. For each portfolio, I run the regression specification (6) to capture the inflation at the turn of quarters, and plot the 95% confidence intervals for dummy variables of quarter end and beginning.



(a) 1990 - 2002

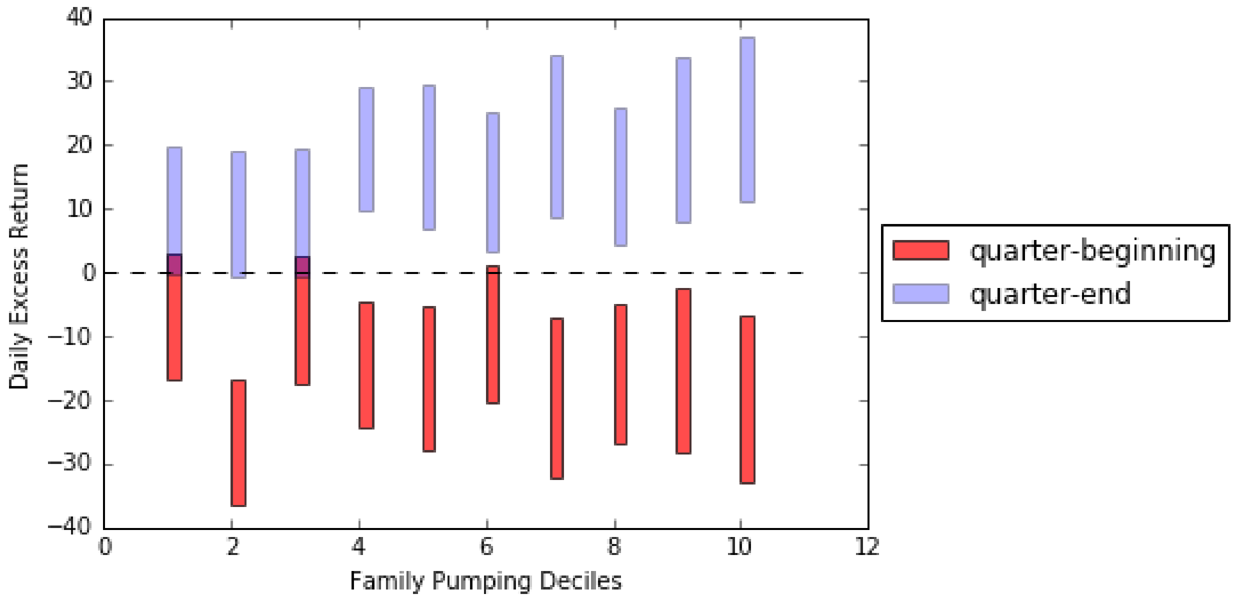


(b) 2003 - 2014

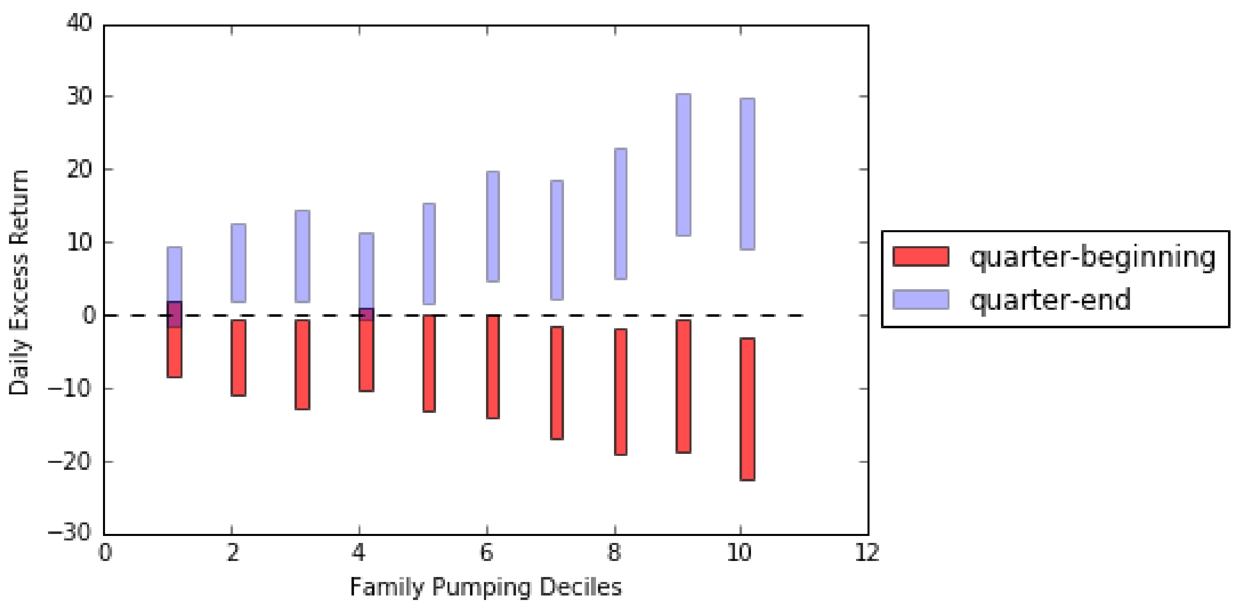
Figure 2

Performance Inflation and Family Pumping

The figure shows the performance inflation of star funds in mutual fund families at the turn of quarters, sorted by *Family Pumping* into deciles. For each decile of *Family Pumping*, I construct an equal-weighted portfolio of funds. For each portfolio, I run the regression specification (6) to capture the inflation at the turn of quarters, and plot the 95% confidence intervals for dummy variables of quarter end and beginning.



(a) 1990 - 2002



(b) 2003 - 2014

Figure 3

Stock Level Response

The figure shows the stock level response to portfolio pumping at family level after 2002. Stocks are sorted into quintiles by *Pumping Pressure* defined in equation (7). I then construct the long/short portfolio of stocks by buying stocks in the top quintile and selling stocks in the bottom. In particular, I study the return of the long/short portfolio in the (-7,7) trading window around the quarter end. The red solid line represents the average cumulative return of the long/short portfolio. The blue dashed line represents the average cumulative abnormal return based on CAPM model. The green dotted line represents the average cumulative abnormal return based on Fama French 4-factors. The factor loadings are estimated over the half-year trading window prior to the quarter end.

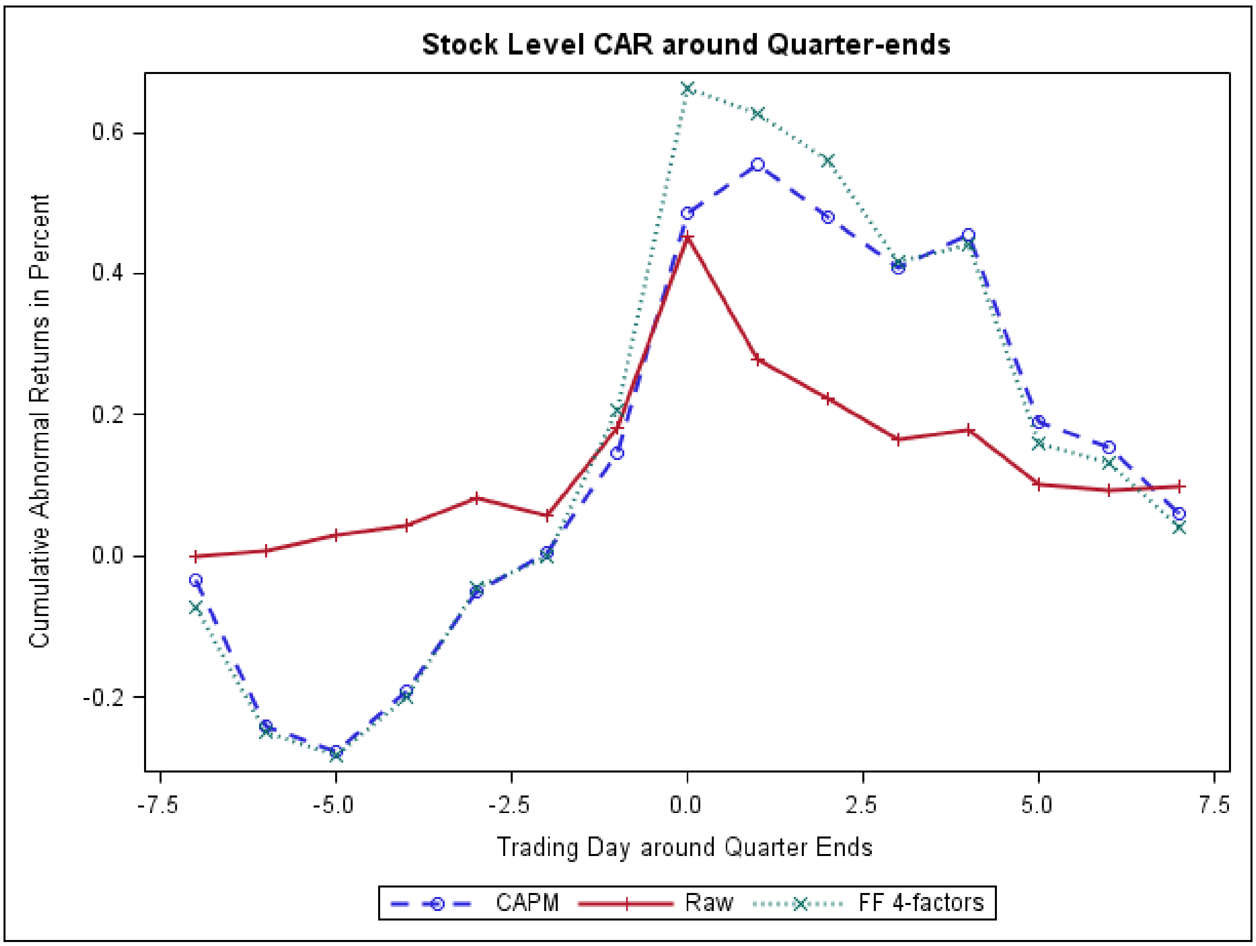


Figure 4
Stock Intra-day Returns
The figure shows the stock level response to portfolio pumping at family level after 2002. Stocks are sorted into quintiles by *Pumping Pressure* defined in equation (7). For each group, I use TAQ data to examine the intra-day return at the end of each quarter. G5 is the group with the highest *Pumping Pressure*. The horizontal axis indicates the time of the day, and vertical axis indicates the cumulative return in basis points.

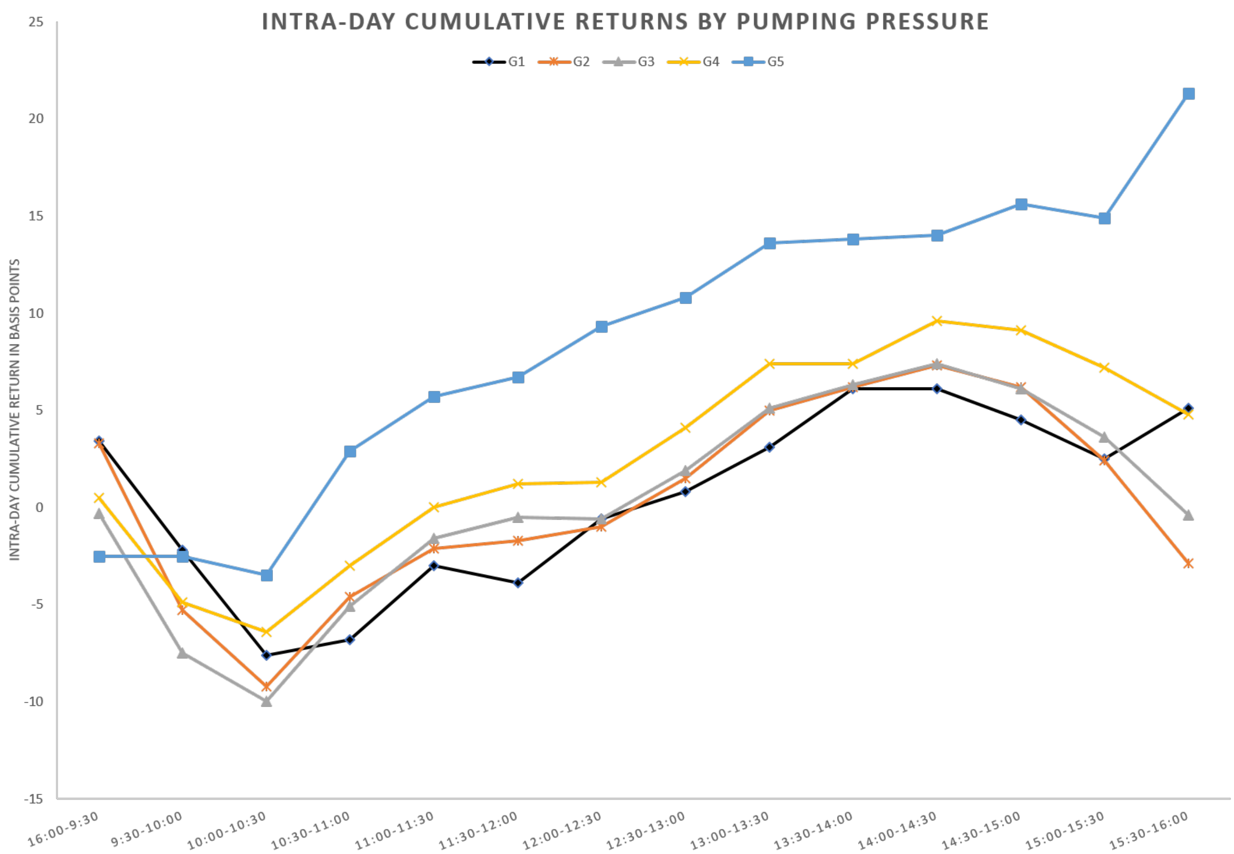
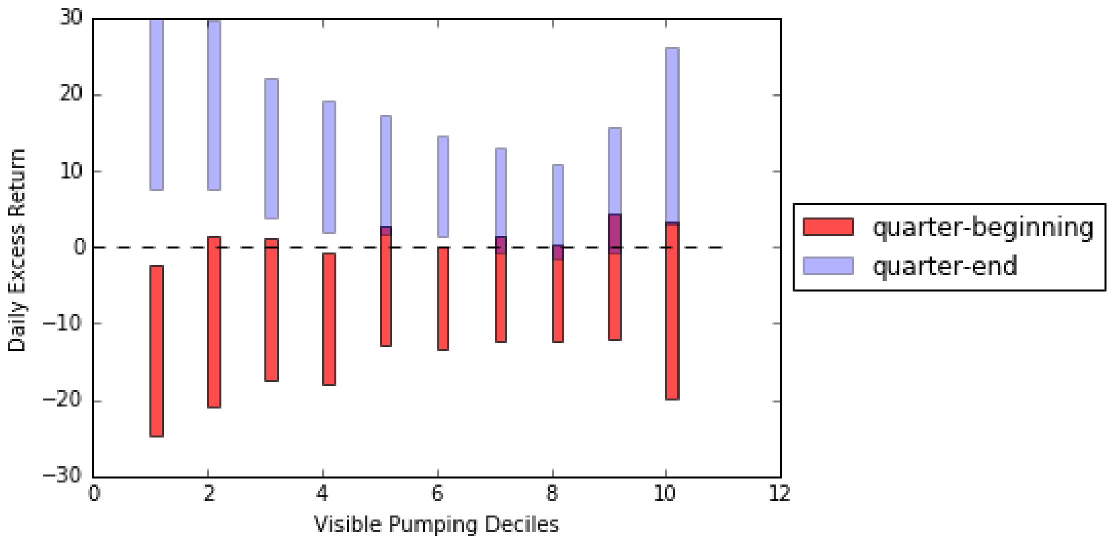


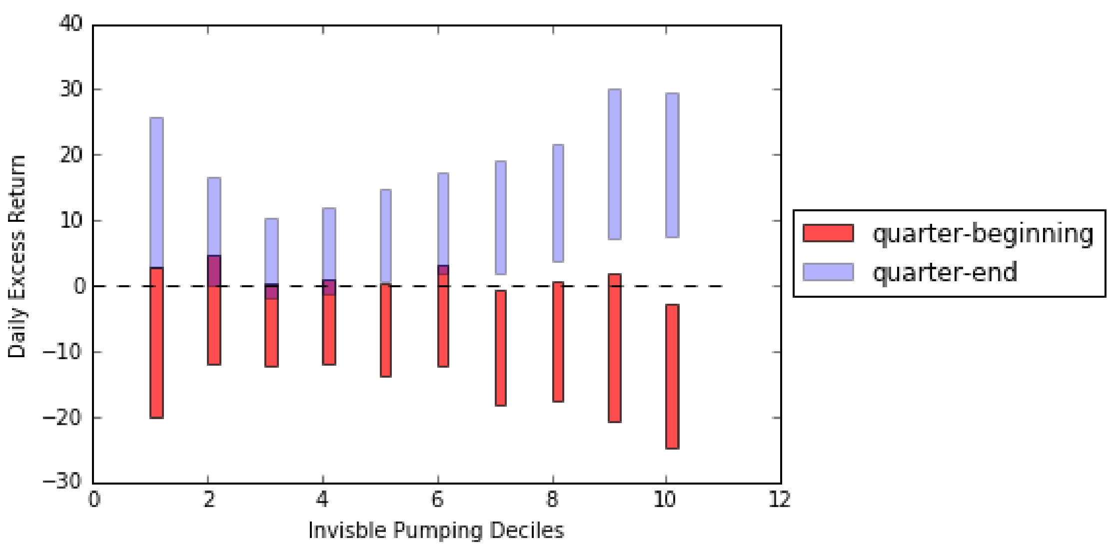
Figure 5

Visible Pumping versus Invisible Pumping

The figure shows how fund families choose stocks to pump. The variable *Family Pumping* is split into visible and invisible family level support, depending on whether stocks that are pumped are in the top-10 holding list of star funds. For each decile of *Visible Family Pumping* (*Invisible Family Pumping*), I construct an equal-weighted portfolio of funds. For each portfolio, I run the regression specification (6) to capture the inflation at the turn of quarters, and plot the 95% confidence intervals for dummy variables of quarter end and beginning. Figure (a) plots the result for visible family pumping, and figure (b) plots the result for invisible one.



(a) Visible Family Level Pumping

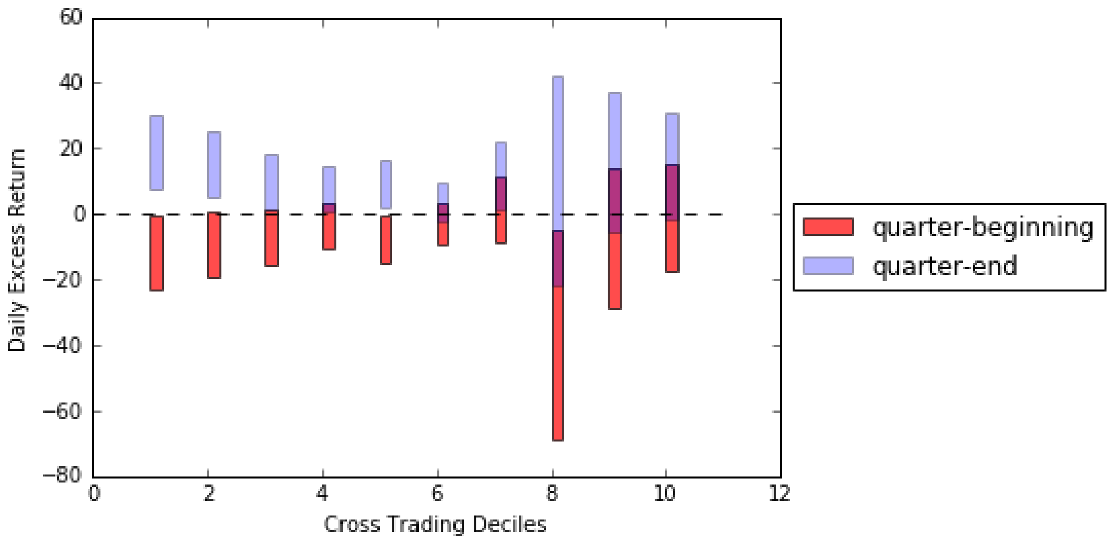


(b) Invisible Family Level Pumping

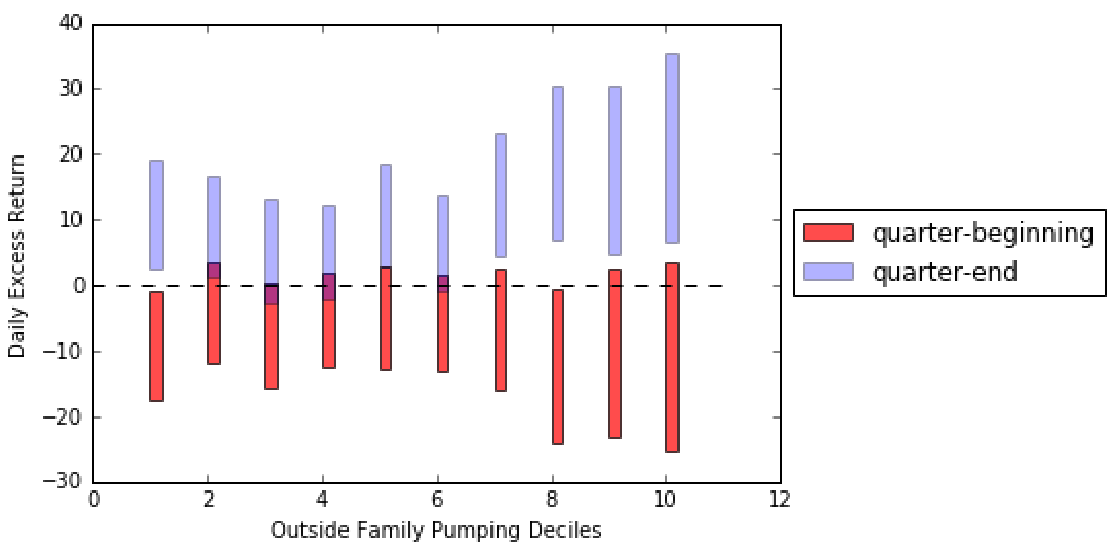
Figure 6

Alternative Explanation for Family Level Pumping

The figure tests two alternative explanations for family-level pumping. Star funds are sorted by either *Cross Trading* or *Outside Family* into deciles. For each decile, I construct an equal-weighted portfolio of funds. For each portfolio, I run the regression specification (6) to capture the inflation at the turn of quarters, and plot the 95% confidence intervals for dummy variables of quarter end and beginning. Figure (a) shows the result for the cross trading hypothesis. Figure (b) shows the result for pumping-outside-family hypothesis.



(a) Cross Trading



(b) Pumping outside the Family

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*^{Purchase} is the sum of products between the 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 (14)). *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 Pumping* quantifies the aggregated favor received by the star funds through portfolio pumping at family level, which is the sum of products between *Shares Purchased* and w^{Star} (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								
Fund Expense	158811	0.012	0.005	0.001	0.026	0.010	0.012	0.015
Fund Turnover	152899	.86	.923	.025	6.48	.3	.61	1.08
TNA	167370	1008.334	2429.639	1.2	16007.8	51.8	199	758.269
Percent Flow	165932	.026	.175	-.328	1.125	-.041	-.008	.043
Manager Skill	137544	-.003	.043	-.164	.162	-.018	-.002	.011
Carhart Alpha	151425	-.003	.032	-.107	.103	-.017	-.002	.012
Net Return	166358	.022	.098	-.249	.259	-.026	.029	.081
Fund Age	167365	13.501	12.878	2	90.417	5.25	10	17
Winner Prop	167370	.22	.155	0	1	.108	.202	.3
Loser Prop	167370	.106	.105	0	1	.041	.087	.143
Common Manager	141278	.425	.494	0	1	0	0	1
Holding Support^{Purchase}	121213	.049	.08	0	.423	.005	.018	.054
Holding Support^{Visible}	121213	.025	.053	0	.289	0	.003	.024
Holding Support^{Invisible}	121213	.022	.035	0	.177	.002	.008	.025
Holding Support$^{Cross\ Trading}$	121213	.027	.085	-.057	.552	0	.002	.017
Holding Support$^{Outside\ Family}$	121213	.027	.036	0	.193	.004	.013	.034
Family Level Summary Statistics								
Number of Funds	21376	6.654	11.76	1	69	1	2	6
Family Expense Ratio	21376	.014	.016	-.003	1.024	.01	.012	.015
Family Turnover Ratio	21376	.882	1.381	0	34.634	.31	.578	.991
Family TNA	21376	5296.641	17595.84	.7	126361.5	33.6	208.7	1601.7
Inst Share	19029	.653	.368	0	1	.282	.814	1
Frac Outsourced	21376	.509	.513	0	10	.111	.333	1
Family Pumping	21376	.043	.141	0	1.017	0	0	.014
Visible Pumping	21376	.014	.049	0	.358	0	0	.002
Invisible Pumping	21376	.026	.088	0	.645	0	0	.008
Fund Pumping	21376	.153	.404	0	2.853	.001	.016	.107
Cross Trading	21376	-1.933	4.616	-14.78	.002	-.158	0	0
Outside Family Pumping	21376	.022	.071	0	.509	0	0	.007

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*^{Purchase} is the sum of products between the 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 (14)). *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	$HS^{Purchase}$	$HS^{Visible}$	$HS^{Invisible}$	$HS^{Cross\ Trading}$	$HS^{Outside\ Family}$	*Fund Expense*	*Fund Turnover*	*TNA*	*Percent Flow*	*Manager Skill*	*Carhart Alpha*	*Net Return*	*Fund Age*
$HS^{Purchase}$	1.000												
$HS^{Visible}$	0.712	1.000											
$HS^{Invisible}$	0.768	0.467	1.000										
$HS^{Cross\ Trading}$	0.427	0.408	0.301	1.000									
$HS^{Outside\ Family}$	0.267	0.206	0.278	0.106	1.000								
Fund Expense	0.056	0.030	0.072	0.074	0.060	1.000							
Fund Turnover	0.112	0.085	0.120	0.072	0.179	0.273	1.000						
TNA	0.018	0.038	-0.014	-0.006	-0.011	-0.289	-0.160	1.000					
Percent Flow	0.102	0.088	0.096	0.007	0.133	-0.029	0.018	0.009	1.000				
Manager Skill	-0.030	-0.024	-0.024	-0.028	-0.019	0.003	-0.004	-0.021	-0.007	1.000			
Carhart Alpha	0.009	0.019	-0.005	0.011	-0.007	-0.075	-0.045	0.030	0.075	0.059	1.000		
Net Return	-0.014	-0.006	-0.025	0.010	-0.030	-0.029	-0.024	0.025	0.084	-0.052	0.268	1.000	
Fund Age	0.016	0.026	-0.003	0.003	0.011	-0.125	-0.083	0.338	-0.076	-0.020	-0.001	0.013	1.000

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).

	(1)	(2)	(3)	(4)	(5)
	$\%\ Flow_{t+1}$	$\%\ Flow_{t+1}$	$\%\ Flow_{t+1}$	$\%\ Flow_{t+1}$	$\%\ Flow_{t+1}$
Carhart Alpha	0.588***	0.596***	0.229***	0.191***	0.184***
	(25.56)	(25.42)	(10.49)	(8.61)	(8.09)
$Carhart\ Alpha^2$		2.019***			
		(5.81)			
Winner Prop	0.0293***	0.0233***	0.0289***	0.0330***	0.0328***
	(5.08)	(4.14)	(5.16)	(6.19)	(6.15)
Loser Prop	-0.00849	-0.0188***	-0.0101	-0.0229***	-0.0232***
	(-1.17)	(-2.60)	(-1.45)	(-3.19)	(-3.22)
Mid Fund			0.0298***	0.0288***	0.0289***
			(24.91)	(23.67)	(23.75)
Top Fund			0.0738***	0.0697***	0.0706***
			(36.08)	(33.36)	(34.29)
Star Family				0.00442***	
				(2.59)	
Star Alpha					0.0440**
					(2.01)
$Manager\ Skill_{t-1}$	0.0994***	0.0990***	0.0547***	0.0386***	0.0387***
	(6.74)	(6.72)	(3.88)	(2.65)	(2.66)
Fund Expense	-4.327***	-4.514***	-3.398***	0.237	0.237
	(-6.42)	(-6.68)	(-5.16)	(0.26)	(0.26)
Fund Turnover	0.00633***	0.00619***	0.00709***	0.00443***	0.00444***
	(4.37)	(4.22)	(4.95)	(3.40)	(3.41)
Fund Size	-0.00404***	-0.00400***	-0.00385***	-0.00698***	-0.00699***
	(-9.91)	(-9.82)	(-9.62)	(-12.54)	(-12.54)
Family Expense				0.770	0.767
				(1.44)	(1.44)
Family Turnover				-0.00130	-0.00130
				(-0.58)	(-0.58)
Family Size				0.00104	0.00106
				(0.77)	(0.79)
Time and Style Fixed Effects	Yes	Yes	Yes	Yes	Yes
Family Fixed Effects	No	No	No	Yes	Yes
N	122618	122618	118482	111881	111881
Adjusted R^2	0.0365	0.0371	0.0577	0.0841	0.0840
F	75.94	72.64	146.8	103.3	103.1

t statistics in parentheses

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

Table 4
What Stocks do They Pump?

This table studies the characteristics of the stocks that families choose to pump. Stocks are sorted into quintiles by *Pumping Pressure* defined in equation (7). Panel A reports the fundamental characteristics of stocks in each quintile. *Assets* and *Market Value* are the book value of assets and market value of equity in billions, respectively. Panel B reports the factor loadings of portfolios for each quintile. The factors are Fama French 4-factors, and Pástor and Stambaugh (2003) liquidity factor.

Panel A: Fundamental Characteristics

Pumping Pressure	Q1	Q2	Q3	Q4	Q5	Diff
Assets	14.00	18.88	15.05	9.85	9.03	-4.97***
Market Value	6.47	8.94	7.99	5.48	3.55	-2.92***
Book to Market	0.61	0.57	0.58	0.59	0.62	0.01
ROA	-0.04%	0.81%	0.94%	0.91%	0.09%	0.13%
Debt Ratio	0.22	0.22	0.21	0.21	0.20	-0.02
Net Income Ratio	-7.00	-0.71	-3.23	-1.76	-4.16	2.84
Past Year Return	16.68%	17.28%	16.78%	17.17%	15.00%	-1.68%**

Panel B: Factor Loadings

Pumping Pressure	Alpha	$R_M - R_f$	HML	SMB	UMD	LIQ
Q_1	1.93	1.09	0.02	0.68	-0.42	0.01
	(0.72)	(19.58)	(0.17)	(7.26)	(-10.64)	(0.22)
Q_2	4.89	1.04	0.02	0.71	-0.26	0.02
	(1.72)	(17.68)	(0.21)	(7.19)	(-6.20)	(0.30)
Q_3	2.81	1.03	0.06	0.73	-0.17	0.05
	(1.12)	(20.04)	(0.68)	(8.40)	(-4.48)	(1.04)
Q_4	2.39	1.00	0.21	0.74	-0.15	0.05
	(1.03)	(20.79)	(2.48)	(9.12)	(-4.30)	(1.06)
Q_5	-3.04	1.10	-0.01	0.83	-0.10	-0.01
	(0.45)	(13.40)	(-0.06)	(6.02)	(-1.66)	(-0.03)

t statistics in parentheses

Table 5
Double Sort of Future Inflow

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

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

$Q_{HS} \backslash Q_{Carhart\ Alpha}$	1	2	3	4	5	L/S
1	-11.8	-7.57	-6.96	0.77	4.4	16.2
	[-6.08]	[-4.64]	[-4.55]	[0.24]	[1.85]	[6.01]
2	-4.88	5.1	6.09	4.3	8.17	13.8
	[-0.90]	[0.75]	[1.54]	[1.20]	[2.52]	[2.22]
3	-0.33	3.32	10.8	17.5	5.31	5.64
	[-0.09]	[0.63]	[0.76]	[1.62]	[2.24]	[1.44]
4	-3.66	15.4	21.4	6.04	14.3	18
	[-1.09]	[1.52]	[1.01]	[1.27]	[2.54]	[2.72]
5	-4.33	2.35	2.26	2.67	11.9	16.3
	[-1.75]	[1.19]	[1.17]	[1.39]	[3.90]	[4.23]
L/S	8.67	11.4	10.3	1.82	7.21	
	[2.15]	[3.40]	[3.29]	[0.37]	[2.57]	

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

$Q_{HS} \backslash Q_{Star\ Portion}$	1	2	3	4	5	L/S
1	-9.32	-9.84	-7.2	-7.64	-6.12	3.24
	[-8.90]	[-9.08]	[-6.48]	[-7.14]	[-5.83]	[2.18]
2	-4.24	-4.48	-4.96	-7.4	-4.48	-0.28
	[-4.92]	[-4.68]	[-4.99]	[-7.26]	[-4.17]	[-0.19]
3	-2.36	-1.8	-0.4	-1.84	-0.76	1.6
	[-1.72]	[-1.24]	[-0.29]	[-1.29]	[-0.47]	[0.74]
4	-0.4	-1.52	0.96	1.16	0.48	0.88
	[-0.35]	[-1.44]	[0.88]	[1.05]	[0.4]	[0.53]
5	1.16	-1.32	0.92	-0.04	2.08	0.92
	[1.01]	[-1.12]	[0.76]	[-0.05]	[1.96]	[0.59]
L/S	10.48	8.52	8.08	7.6	8.2	
	[6.73]	[5.36]	[4.97]	[5.02]	[5.48]	

t statistics in parentheses

Table 6

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 5. *Holding Support* is further divided into two parts, depending on whether the stocks pumped fall into the top-10 holding list of star funds. *Holding Support*^{Visible} (VHS) and *Holding Support*^{Invisible} (IHS) are defined in Equations (15) and (16), 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 (annualized) 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	-4.66	2.26	2.71	7.42	9.94	14.5
	[-2.59]	[0.76]	[1.33]	[1.88]	[4.03]	[5.13]
2	-3.87	8.07	4.05	8.47	8.77	12.6
	[-1.37]	[1.21]	[1.08]	[1.80]	[3.27]	[3.29]
3	-2.66	30.7	0.01	1.62	21.3	24
	[-1.13]	[0.89]	[0.00]	[0.42]	[1.24]	[1.38]
4	-5.63	-0.56	2.22	2.88	13.5	19.1
	[-1.96]	[-0.37]	[0.65]	[1.09]	[3.35]	[3.93]
5	-3.55	2.99	2.6	3.92	19.8	23
	[-1.36]	[1.24]	[1.05]	[1.98]	[2.15]	[2.44]
L/S	1.11	0.73	-0.31	-3.5	9.44	
	[0.40]	[0.19]	[-0.10]	[-0.78]	[1.08]	

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	-12.8	-6.75	-5.66	-0.32	5.23	18
	[-6.11]	[-3.50]	[-2.44]	[-0.08]	[1.69]	[5.90]
2	-2.91	-0.94	10	4.95	13.8	16.7
	[-0.55]	[-0.31]	[1.51]	[1.82]	[2.63]	[2.24]
3	1.42	5.65	10.6	25	3.9	2.42
	[0.28]	[0.84]	[1.96]	[1.10]	[1.74]	[0.44]
4	-4.23	29.2	3.12	10.3	11.5	15.7
	[-2.04]	[1.52]	[1.05]	[2.74]	[1.77]	[2.24]
5	-2.36	2.75	3.25	6.99	14.5	16.9
	[-0.74]	[1.53]	[1.67]	[1.35]	[4.59]	[3.81]
L/S	13.2	8.74	6.86	7.12	8.79	
	[1.98]	[2.50]	[2.15]	[2.40]	[2.41]	

t statistics in parentheses

Table 7

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 $Holding\ Support^{Purchase}$ is shown in Equation (14). The constructions of $Holding\ Support^{Visible}$ and $Holding\ Support^{Invisible}$ are shown in Equations (15) and (16). *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.

	(1) % $Flow_{t+1}$	(2) % $Flow_{t+1}$	(3) % $Flow_{t+1}$	(4) % $Flow_{t+1}$
$HS^{Purchase}$	9.299***			
	(5.19)			
$HS^{Visible}$		11.88***		8.593**
		(5.00)		(2.20)
$HS^{Invisible}$			18.00***	12.38***
			(4.59)	(3.45)
Carhart Alpha	0.370***	0.370***	0.371***	0.370***
	(9.19)	(9.18)	(9.20)	(9.18)
$Star\ Flow_{t+1}$	0.189***	0.189***	0.189***	0.189***
	(8.15)	(8.16)	(8.12)	(8.13)
Star Alpha	-0.00676	-0.00671	-0.00622	-0.00670
	(-0.81)	(-0.80)	(-0.74)	(-0.80)
Winner Prop	0.0166	0.0167	0.0175	0.0167
	(1.09)	(1.09)	(1.15)	(1.09)
Loser Prop	-0.0331***	-0.0332***	-0.0337***	-0.0330***
	(-2.88)	(-2.89)	(-2.94)	(-2.87)
$Manager\ Skill_{t-1}$	0.0509**	0.0505**	0.0500**	0.0509**
	(2.50)	(2.49)	(2.46)	(2.50)
Fund Expense	-2.668	-2.641	-2.684	-2.672
	(-1.41)	(-1.39)	(-1.43)	(-1.41)
Fund Turnover	0.00248	0.00273	0.00252	0.00240
	(0.54)	(0.60)	(0.54)	(0.52)
Fund Size	-0.00764***	-0.00764***	-0.00760***	-0.00764***
	(-6.41)	(-6.42)	(-6.38)	(-6.41)
Family Size	0.00218	0.00232	0.00217	0.00214
	(0.96)	(1.02)	(0.95)	(0.94)
Family Expense	0.585	0.629	0.593	0.582
	(0.91)	(0.98)	(0.91)	(0.90)
Family Turnover	-0.00145	-0.00144	-0.00155	-0.00146
	(-0.48)	(-0.47)	(-0.52)	(-0.49)
Time and Style Fixed Effects	Yes	Yes	Yes	Yes
Family Fixed Effects	Yes	Yes	Yes	Yes
N	89674	89674	89674	89674
Adjusted R^2	0.0813	0.0810	0.0809	0.0813
F	20.35	20.34	20.17	19.41

t statistics in parentheses

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

Table 8

Future Retail/Institution Inflow and *Holding Support*

The table studies how next quarter retail/institution flow reacts to *Holding Support*. 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 $Holding\ Support^{Purchase}$ is shown in Equation (14). $Carhart\ Alpha_t$ 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 in the family. $Manager\ Skill_{t-1}$ 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.

	(1)	(2)
	$\%\ Inst\ Flow_{t+1}$	$\%\ Retail\ Flow_{t+1}$
$HS^{Purchase}$	19.45***	7.647***
	(4.14)	(3.59)
Carhart Alpha	0.497***	0.368***
	(4.99)	(7.60)
$Star\ Flow_{t+1}$	0.286***	0.161***
	(3.98)	(6.39)
Winner Prop	0.0584**	0.0237
	(2.01)	(1.25)
Loser Prop	-0.0340	-0.0296**
	(-1.13)	(-2.25)
Star Alpha	-0.0641*	0.00219
	(-1.96)	(0.24)
$Manager\ Skill_{t-1}$	0.181***	0.0375
	(2.82)	(1.28)
Fund Expense	21.04***	-12.82***
	(4.45)	(-5.19)
Fund Turnover	-0.00887**	0.00446
	(-2.09)	(0.79)
Fund Size	-0.000676	-0.0128***
	(-0.26)	(-8.19)
Family Size	0.000532	0.00346*
	(0.05)	(1.70)
Family Expense	0.740	1.452*
	(0.25)	(1.80)
Family Turnover	-0.0159	-0.00571
	(-1.55)	(-1.33)
Time and Style Fixed Effects	Yes	Yes
Family Fixed Effects	Yes	Yes
N	51349	77625
Adjusted R^2	0.0423	0.0739
F	15.67	17.70

t statistics in parentheses

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

Table 9

Advertisement and Pumping Activity

The table shows the relation between the next quarter advertisement exposure for a fund and its current quarter pumping activity. The dependent variable Ad_{t+1} is equal to one if the fund has solely advertisement exposure in the next quarter. The dummy *HS Top* is equal to one if the fund is sorted into the top quintile of *Holding Support*. I run a set of logistic regression of Ad_{t+1} dummy on *HS Top* dummy, controlling for fund and family characteristics. Standard errors are clustered at family level.

	(1)	(2)	(3)
	Ad_{t+1}	Ad_{t+1}	Ad_{t+1}
HS Top	0.496*	0.469*	0.464*
	(1.85)	(1.66)	(1.70)
Fund Size	0.0933	0.0607	-0.174
	(0.57)	(0.36)	(-0.60)
Fund Expense	237.3	193.3	-212.2
	(0.69)	(0.52)	(-0.21)
Fund Turnover	-0.212	-0.242	0.0593
	(-0.79)	(-0.98)	(0.23)
Past Perf	-4.187	-3.944	3.785
	(-0.99)	(-0.93)	(0.78)
Ad		1.461	-0.243
		(1.07)	(-0.21)
Constant	6.725***	6.305**	-23.15
	(2.62)	(2.56)	(-1.51)
Family FE	No	No	Yes
Style FE	No	No	Yes
N	315	315	295
Pseudo R^2	0.128	0.138	0.283

t statistics in parentheses

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

Table 10

Future Performance of Pumping Funds

This table tests pumping managers' performance in the future. All non-star funds are sorted by previous quarter alpha into quintiles. Conditional on each performance quintile, funds are then sorted by *Holding Support*^{Purchase} into quintiles. For each conditional double-sort block, I form a portfolio of funds, and regress portfolio returns on Fama French 4 factors. In panel A, I study the short-term performance of pumping funds, so that funds are held for only one month. In panel B, funds are held for 12 months, and long-term performance of pumping funds is tested.

Panel A:Next Month Performance

$Q_{HS} \backslash Q_{Carhart\ Alpha}$	1	2	3	4	5
1	2.76	3.89	1.2	0.57	-0.88
	[2.63]	[1.97]	[0.67]	[0.29]	[-0.19]
2	1.72	1.33	-1.84	0.66	2.62
	[0.80]	[0.80]	[-0.92]	[0.38]	[0.95]
3	2.36	-0.82	-0.48	1.48	-0.2
	[0.95]	[-0.61]	[-0.40]	[1.10]	[-0.09]
4	-2.8	0.21	-0.2	-0.31	1.97
	[-1.43]	[0.15]	[-0.17]	[-0.29]	[1.41]
5	-0.57	-1.27	-1.05	-1.88	-0.82
	[-0.36]	[-1.14]	[-0.95]	[-1.64]	[-0.45]
L/S	-3.33	-5.16	-2.25	-2.45	0.06
	[-3.24]	[-1.99]	[-1.36]	[-1.18]	[-0.03]

Panel B:Next 12 Months Performance

$Q_{HS} \backslash Q_{Carhart\ Alpha}$	1	2	3	4	5
1	-1.81	0.26	0.06	0.43	0
	[-1.71]	[0.42]	[0.13]	[0.69]	[0.00]
2	0.09	-0.59	-0.14	0.26	1.2
	[0.09]	[-1.19]	[-0.31]	[0.57]	[1.27]
3	-0.86	0.34	-0.57	0.71	0.21
	[-1.01]	[0.85]	[-1.78]	[1.90]	[0.32]
4	-0.18	0.32	0.05	0.03	0.61
	[-0.26]	[0.89]	[0.19]	[0.08]	[1.14]
5	0.04	0.16	-0.15	0.05	-0.36
	[0.05]	[0.42]	[-0.38]	[0.12]	[-0.55]
L/S	1.85	-0.33	-0.26	-0.26	-0.46
	[1.65]	[-0.51]	[-0.59]	[-0.48]	[-0.56]

t statistics in parentheses

Table 11
Determinants of *Holding Support*

The table studies the determinants of the fund's *Holding Support*. Funds are sorted by *Holding Support* into quintiles, and *HS Top* is a dummy variable that equals one if the fund is in the top quintile. *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.

	(1) *HS Top*	(2) *HS Top*	(3) *HS Top*
Common Manager		0.114***	0.113***
		(9.58)	(9.55)
Fourth Quarter			0.00486**
			(2.17)
Out Source	-0.00220	-0.00678	-0.00678
	(-0.69)	(-1.26)	(-1.26)
Inst Share	0.0107	0.00912	0.00911
	(0.72)	(0.79)	(0.79)
Manager Skill$_{t-1}$	-0.102	-0.0930*	-0.0932*
	(-1.39)	(-1.89)	(-1.88)
Fund Expense	4.388	4.044	4.071
	(0.77)	(0.89)	(0.89)
Fund Turnover	0.0888***	0.0707***	0.0707***
	(6.11)	(5.39)	(5.39)
Fund Size	0.00558	0.00719**	0.00718**
	(1.45)	(2.48)	(2.47)
log(*Fund Age*)	-0.00336	-0.00364	-0.00365
	(-0.43)	(-0.61)	(-0.61)
Family Size	0.0106	0.0241***	0.0241***
	(1.53)	(6.01)	(6.00)
Family Expense	-1.478	2.572	2.606
	(-0.41)	(1.24)	(1.26)
Family Turnover	-0.0239	-0.00466	-0.00465
	(-1.28)	(-0.46)	(-0.46)
Style Fixed Effects	Yes	Yes	Yes
Family Fixed Effects	Yes	Yes	Yes
N	56818	84731	84731
Adjusted R^2	0.168	0.144	0.144
F	43.77	49.39	48.27

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

Table 12

Family Pumping Sorted by Year-end Reversals in 2002

The table shows whether the heavily pumped mutual fund families before 2002 are the ones that employ the strategy of family-level pumping. 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 Pumping* 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 13
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 Pumping* (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. $Family\ Alpha_{-4,-12}$ 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. *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.

	(1) *Family Pumping Top*
Family Alpha	1.041
	(0.75)
$Family\ Alpha_{-4,-12}$	4.414***
	(5.96)
Number of Funds	0.0451***
	(7.71)
Distinct Style	0.0490
	(0.79)
Family Expense Ratio	51.06***
	(3.10)
Family Turnover Ratio	0.0838
	(1.02)
Lag Family Size	0.412***
	(8.53)
Frac Outsourced	3.414***
	(3.62)
Star Portion	-1.569***
	(-9.31)
χ^2	435.80
Observations	10961

t statistics in parentheses

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

Appendices

Figure A1
Snapshot of BlackRock Advantage U.S. Total Market Fund
The figure is a snapshot of BlackRock Advantage U.S. Total Market Fund web page. It discloses the top ten largest equity holdings as of August 31, 2018.

Holdings

Top

as of Jun 29, 2018

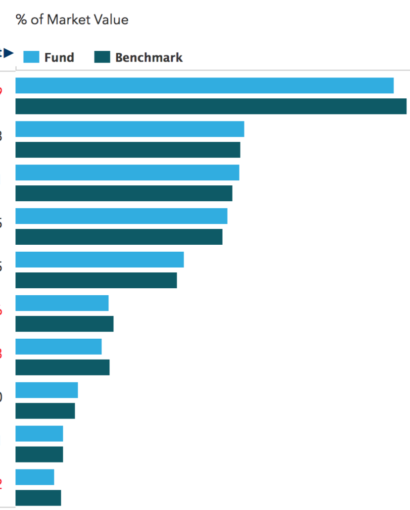
Name	Weight (%)	Name	Weight (%)
APPLE INC	2.88	MASTERCARD INC	1.73
AMAZON.COM INC	2.45	TEXAS INSTRUMENTS INC	1.47
MICROSOFT CORPORATION	2.12	CONOCOPHILLIPS	1.41
FACEBOOK INC	2.11	GILEAD SCIENCES INC	1.30
JOHNSON & JOHNSON	1.97	PROLOGIS INC	1.26

Exposure Breakdowns

Sector | Geography | Market Cap

as of Jun 29, 2018

Type ▲	Fund ▶	Benchmark ▶	Net ▶
Information Technology	23.96	24.75	-0.79
Financials	14.49	14.26	0.23
Health Care	14.17	13.76	0.41
Consumer Discretionary	13.46	13.11	0.35
Industrials	10.70	10.25	0.45
Consumer Staples	5.95	6.22	-0.26
Energy	5.49	6.02	-0.53
Real Estate	4.03	3.84	0.20
Materials	3.08	3.07	0.01
Utilities	2.50	2.92	-0.42



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