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## Abstract

Using U.S. equity mutual fund data, we show that portfolio pumping – an illegal trading activity that artificially inflates year-end and quarter-end portfolio returns – is more pronounced among single-managed than team-managed funds. The return inflation by team-managed funds is 45% lower than by single-managed funds at year-ends. Also, portfolio pumping decreases as team size increases. These results are driven by peer effects among teams and, in some cases, amplified by less convex flows – performance relation in team-managed funds. Our findings are robust to differences in fund governance, manager career concerns, local networks, fund-family policies, and the SEC enforcement.



*JEL classifications:* D70; G23; K22

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## 1. Introduction

This paper investigates whether team-based organizations deter agents from engaging in deceptive investment practices. Our specific focus is on the extent of portfolio pumping – an illegal fund trading activity – among single-managed and team-managed funds in the U.S. mutual fund industry (see Appendix for the U.S. Securities and Exchange Commission's (SEC) litigation cases involving this activity). As shown in previous studies (e.g., Zweig, 1997, 2011; Carhart et al., 2002; Bernhardt and Davies, 2005; Ben-David et al., 2013), portfolio pumping occurs when fund managers artificially inflate their year-end (and quarter-end) performance by placing large orders on existing holdings. This leads to a temporary surge in fund returns on the last day of the year (quarter) and typically reverts on the first day of the next year (quarter). Given that the SEC must prove that the "intent" of trading was to manipulate with fund returns, convicting a manager of portfolio pumping is the biggest challenge for capital market regulators (Zweig, 1997; Zweig and McGinty, 2012). The return reversal in the beginning of the next period provides only indirect evidence of such manipulation.

The propensity of an organization to engage in an illegal activity depends on its costs and benefits (Becker, 1968). Different organizational structures impose different costs on agents for taking risks. Fama and Jensen (1983) argue that the choice of organizational structure is an important factor in controlling agency costs. For instance, Kandel and Lazear (1992) show that the presence of peer monitoring and joint monetary incentives in teams, which we call *peer effects*, can be effective in countervailing agency costs in team-based organizations.[1] Since, compared to employers, agents are in a better position to monitor their peers, peer monitoring ensures individual accountability of team members. This monitoring can take the form of a greater peer pressure to adhere to the "right" behaviour (Arnott and Stiglitz, 1991; Mas and

[1] Cheating may sometimes be more prevalent in teams because individuals' actions are imperfectly observed in a team, and team members can blame each other if cheating activities are detected. However, this is a remote possibility in the fund industry, because fund families can observe the trading activities of each individual portfolio manager within a team.

Moretti, 2009).[2] Joint monetary incentives ensure that teams divide their total output among all members, which, in turn, reduces the benefits of cheating to individual members, thereby transforming high-powered incentives into low-powered ones and reducing each individual member's monetary incentives to cheat (Ma et al., 1988; Acemoglu et al., 2008).[3] Therefore, *peer effects* can be an effective mechanism for firms to overcome agency problems such as deceptive managerial behaviour. However, almost all the aforementioned studies are theoretical, and very few existing empirical results focus only on free-riding. To the best of our knowledge, no empirical study on the relationship between organizational structure and deception has been conducted.

In this study, we fill this gap by testing the relationship between organizational structure and deception using actively managed U.S. domestic equity mutual funds from 1992 to 2015. There are two reasons why fund data are ideal for the analysis of the impact of group decision-making on deceptive actions. First, the mutual fund industry provides a large comprehensive single source of occupational data, with a rich mix of team- and single-managed funds with a clear task of generating maximum returns. Second, the fund industry has certain types of trading practices that are illegal and can be tested empirically.

We begin by examining portfolio pumping in single- and team-managed funds based on the funds' daily excess returns. We compare these returns around the turn of the calendar year and quarters with returns for the rest of the year. First, in line with previous findings, we obtain strong evidence of portfolio pumping over the entire sample period. However, we find that team-managed funds pump their portfolios significantly less than single-managed funds, at both the year- and quarter-ends. Figure 1 shows the differences in average daily excess returns (in excess of S&P 500) for single- and team-managed funds around the year-ends. After controlling for fund

[2] The SEC's whistleblower programme encourages people to report fraud in their firm and makes fraud reporting easier, thus deterring illegal trading activities (http://www.sec.gov/whistleblower).
[3] Note that the costs of cheating in a group also increase. For example, in the United States, if two or more people commit a crime, in addition to facing charges for committing a crime, they all are likely to be charged with conspiracy to commit that crime (source: https://www.law.cornell.edu/uscode/text/18/371).

characteristics, such as fund size, age, fees, turnover, flows, and family size, the average year-end and quarter-end (beginning-of-year and beginning-of-quarter) daily excess returns of team-managed funds are, respectively, 45% lower (20% higher) than those of single-managed ones.

We also examine whether the size of a team affects portfolio pumping. We find that, with an increase of the number of fund managers in a team, portfolio pumping monotonically decreases. The average daily excess year-end returns of two-, three-, and four- (or more) member teams are, respectively, 36%, 46%, and 54% *lower* than those of single-managed funds. Similarly, the average year-beginning returns of two-, three-, and four- (or more) member teams are, respectively, 11%, 23%, and 39% *higher* than those of single-managed funds.

We then compare the extent of portfolio pumping activity across a group of mutual funds that changed their managerial structure (from single- to team-managed and vice versa) to that of a characteristics-matched control group of funds that did not. Using propensity score matching, we find that the funds that switch from single- to team-managed structure obtain about 50–65% lower year-end and quarter-end returns as compared to those obtained by the matched control sample of single-managed funds.

Next, we examine how teams affect portfolio pumping incentives. It can be conjectured that the negative relationship between team-managed funds and portfolio pumping is driven not by peer effects, but by weaker incentives among teams to engage in portfolio pumping. In this respect, Carhart et al. (2002) argue that the convexity in flow-performance relationship creates adverse incentives for fund managers to engage in portfolio pumping to attract additional fund flows.[4] This incentive is the strongest for those funds that are near the top past performance distribution, because, by artificially inflating their portfolio value, these funds disproportionally improve their year (or quarter)-end ranking and profit from the convexity of flow-performance relation. Now, if convexity is behind portfolio pumping, then we should expect team-managed

[4] Many studies show the convexity of the flow-performance relationship (e.g., Chevalier and Ellison, 1997; Sirri and Tufano, 1998; Del Guercio and Tkac, 2002; Huang et al., 2007). The convexity is a result of investors' rewarding the funds with stellar performance with additional flows, without equivalent penalizing the funds with poor performance.

funds to have a less convex flow-performance relationship. Consistently with this intuition, we find that the flow-performance relationship is significantly less convex for team-managed funds than for single-managed funds. Moreover, the convexity of this relationship almost monotonically decreases with team size. This implies that team-managed funds – and more particularly, those with a large number of managers – have fewer incentives to manipulate returns. This is so because, after a strong performance, such funds receive far fewer additional money flows than comparable single-managed funds.

Note that a weaker incentive to pump among team-managed funds due to the less convex flow-performance relationship does not fully explain our results. We find significant reduction in pumping even among those team-managed funds that are least affected by the convexity of flow-performance relationship. These include the funds with medium or poor past performance. Therefore, the observed reduction in pumping among team-managed funds with the best past performance can be attributed to both peer effects and less convex flow-performance relationship. Due to the lack of detailed data on intra-team interactions and actual compensation of managers, we are unable to differentiate among these two effects in the present study. However, the reduction in pumping among medium or poor past performance team-managed funds can be explained by peer effects alone, since there is no significant difference in convexity between such team-managed funds and their single-managed counterparts. Taken together, these results imply that, while peer effects lead to teams' lower portfolio pumping across the entire range of past fund performances, less convexity of flow-performance relationship in team-managed funds amplifies the reduction in portfolio pumping only among the top past performing funds.

We discuss several alternative explanations for our findings. We consider two main alternative hypotheses: (i) the quality of fund governance (Adams et al., 2010; Ding and Wermers, 2013); and (ii) career concerns of fund managers (Chevalier and Ellison, 1999). We find no support for those two alternative hypotheses in explaining our results. First, fund governance plays little role in preventing managers from participating in deceptive behaviour. In

particular, we find that portfolio pumping occurs more frequently among single-managed funds, as compared to team-managed funds, even for funds with strong governance mechanisms, such as those with large board size or high proportion of independent board directors. This is not surprising, since boards are not involved in monitoring the day-to-day activities of fund managers. Second, we find no differences in deceptive managerial trading behaviour based on managers' industry tenure, particularly among single-managed funds. This indicates that managers' career concerns do not drive their decision to engage in deceptive portfolio trading activity.

Other potential explanations – such as different learning opportunities for fund managers across locations (i.e., local networks), unobserved fund family characteristics (e.g., variations in reporting standards), and the SEC's movement towards more stringent monitoring of trading activities after 2001 – show little relevance to our findings. In addition, we find reduction in portfolio pumping in team-managed funds irrespective of the ease of pumping, which can be linked to those funds that are less liquid, more concentrated, or have a higher active share.

In summary, our results demonstrate that *both* peer effects and convex flow-performance relation explain why team-managed funds engage less in portfolio pumping. Therefore, our findings show that team-management in the fund industry is associated with a reduction in portfolio pumping activities. Effectively, teams help alleviate the weaknesses of the fund board and SEC in controlling, identifying, and penalizing portfolio pumping activity.

The rest of the paper is structured as follows. Section 2 examines the extent of portfolio pumping in single- and team-managed funds. Section 3 shows the flow-performance relationship across funds with different managerial structure and analyses its effect on portfolio pumping relative to peer effects. Section 4 focuses on alternative views for the weaker portfolio pumping effect among team-managed funds. Section 5 discusses various robustness issues. Section 6 concludes.

## 2. Portfolio Pumping and Managerial Structure

### 2.1 The Phenomenon of portfolio pumping and its estimation methodology

Both academic literature and professional reports document that stock and equity fund returns exhibit various seasonality effects, including unusually large fund returns on the last trading day of the year. While some evidence of artificial stock price inflation by fund managers made the headlines in the popular press (Zweig, 1997, 2011), the first comprehensive study of both yearly and quarterly mutual fund performance manipulation was conducted by Carhart et al. (2002). Furthermore, Ben-David et al. (2013) found similar price manipulations in hedge funds. This is a very distractive practice for investors, because, after a temporary gain in performance and when the impact from the positive price pressure is over, stock prices usually fall back to previous levels. This practice is illegal, and the SEC has charged several portfolio managers with such behaviour.[5]

The frequency of abnormal patterns in fund returns coincides with the reporting frequencies among mutual funds.[6] Among several other studies, Ippolito (1992) and Sirri and Tufano (1998) observe that money flows into the best-performing funds. Since fund managers' compensation depends on attracting new inflows to their funds, fund managers have a strong incentive to inflate their performance by the reporting dates. Several previous theoretical studies justify the existence of portfolio pumping and provide some predictions on the extent of this phenomenon across funds. For instance, Bhattacharyya and Nanda (2013) develop an equilibrium model where managers have incentives to alter the closing prices of their security holdings. Bernhardt and Davies (2009) show that portfolio pumping is persistent: the mutual funds involved in portfolio pumping in one quarter are likely to do it again in the following quarter.

[5] Other studies on price manipulation practices by mutual funds include Gaspar, Massa, and Matos (2006), who find performance allocation based on differential incentives of fund management; Ben-Rephael and Israelsen (2013), who report that some institutional clients of portfolio managers systematically receive better prices than others; and Hu, McLean, Pontiff, and Wang (2014) who attribute year-end spikes in NAV to depressed selling, rather than to excess buying by large institutional investors.

[6] In May 2004, the SEC increased the required portfolio disclosure frequency from semi-annual to quarterly. Before 2004, funds could voluntarily report on the quarterly basis.

After the results of Carhart et al. (2002) became public in around the year 2000, the SEC began scrutinizing suspicious fund trading activities and invested more effort into the enforcement of the existing trading laws. As a result of these actions, in June 2001, the SEC filed the first fraud charges against a fund manager for market manipulation and portfolio pumping.[7] Our focus is not on the frequency of speculative price manipulation over time, but on the cross-sectional differences in the extent of portfolio pumping between team- and single-managed funds.

Our primary source of mutual fund data is the survivorship-bias-free MorningStar Direct (MD) database. Our sample covers actively managed U.S. domestic open-end equity mutual funds from January 2, 1992 to December 31, 2015. We focus on the funds with aggressive growth (including small companies), growth, growth & income, as well as equity income investment objectives. Due to very limited sample sizes, we combine the last two categories into one growth and income group. We exclude all sector, balanced, international, and index funds from our analysis. The dataset includes daily fund returns (net of expenses), which is our main variable of interest. We additionally use several fund characteristics as control variables, such as fund size, turnover, fees, age, fund family size, and flows. Fund size (millions, $) is the total net assets (TNAs) under the fund's management at the end of the year. Fund turnover (in percentage) is the minimum of aggregated sales or aggregated purchases of securities in a year divided by the average 12-month TNAs of the fund. Fund fees (in percentage) are the annual total expense ratio of the fund. Fund age is the number of years since the fund inception. Family size (billions, $) is the TNAs under the management of the fund family at the end of the year. Fund flows are the net growth (as a percentage of its total net assets) in the TNAs of the fund adjusted for prior year returns. Since all fund characteristics are measured at individual fund level, we aggregate mutual fund share class level return observations to individual fund level using a unique fund identifier in MD. To obtain excess fund returns, we subtract the daily fund returns from the returns of the

[7] Duong and Meschke (2016) find that there was a substantial decrease in portfolio pumping activity after 2001.

S&P 500 index. To minimize the effect of outliers on our analysis we trim daily excess fund returns at 1% and 99% levels.

MD also contains the names of fund managers responsible for the day-to-day management of the fund each year and their exact joining and leaving dates.[8] We determine the managerial structure of each fund based on the total number of fund managers at the end of the calendar year. If a fund names only one manager at the end of calendar year, we classify that fund as single-managed for that year. Conversely, if a fund names two or more fund managers, we classify that fund as team-managed. Next, we divide team-managed funds into funds with two, three, and four (or more) distinct fund managers at the end of the calendar year and denote them as 2 FM, 3 FM, and 4+ FM, respectively. We remove all fund years for which fund manager names or tenure dates are missing. Our final sample covers a total of 3,929 unique funds with 8,689,374 daily observations.

Table 1 shows the summary statistics. It reports the means and standard deviations of daily fund excess returns and other fund characteristics across various team sizes, as well as the number of observations. Consistent with Patel and Sarkissian (2017) and Han, Noe, and Rebello (2017), we observe that the average returns of team-managed funds are higher than those of single-managed ones. The results also show that average fund size of team-managed funds is larger than that of single-managed ones. However, the average fund size for the funds managed by fewer than four people is, in fact, smaller than that of single-managed funds. Only the funds with four or more managers have substantially larger total net assets than their single-manager counterparts. The turnover of team-managed funds is substantially lower than that of single-managed ones. Multi-manager funds also charge lower fees to their clients. Note that funds with four or more managers tend to have substantially lower turnover and fees as compared not only to single-managed funds, but also to other team-managed funds with smaller team sizes. However,

[8] Massa, Reuter, and Zitzewitz (2010) and Patel and Sarkissian (2017) show that MD has a much higher accuracy in reporting fund managerial structure than both CRSP and Morningstar Principia, which often report a single manager for a team-managed fund and vice versa.

single-managed funds attract more flows than the funds with any team structure. Finally, the family size of team-managed funds is significantly smaller than that of single-managed funds.

To estimate the impact of managerial structure on portfolio pumping, we amend the Carhart et al.'s (2002) methodology with *Team* dummy, fund controls, and year fixed effects *Year_FE*. Our regression model is shown in Eq. (1).

$$\begin{aligned} r_{i,t} = {} & b_0 + b_1 YEnd_t \times Team_{i,t-1} + b_2 YBeg_t \times Team_{i,t-1} + b_3 QEnd_t \times Team_{i,t-1} + \\ & + b_4 QBeg_t \times Team_{i,t-1} + b_5 MEnd_t \times Team_{i,t-1} + b_6 MBeg_t \times Team_{i,t-1} + \\ & + b_7 YEnd_t + b_8 YBeg_t + b_9 QEnd_t + b_{10} QBeg_t + b_{11} MEnd_t + b_{12} MBeg_t + \\ & + b_{13} Team_{i,t-1} + \boldsymbol{\delta} Fund\_Controls_{i,t} + \boldsymbol{\gamma} Year\_FE_t + e_{i,t} \end{aligned} , \quad (1)$$

where $r_{i,t}$ is the fund *i* daily return (net of expenses) in excess of the daily S&P 500 index return. Independent variables include $Team_{t\text{-}1,i}$, which is a dummy variable that equals one if fund *i* has two or more managers at the *beginning* of year, and zero otherwise.[9] *YEnd* (*YBeg*) is the last (first) trading day of year dummy. *QEnd* is the last trading day of the quarter, i.e., March, June, or September dummy; *QBeg* is the first trading day of the quarter, i.e., April, July, or October dummy. *MEnd* is the last trading day of February, April, May, July, August, October, or November dummy; finally, *MBeg* is the first trading day of February, March, May, June, August, September, November or December dummy. Fund controls are fund size, age, turnover, past performance, fees, and fund family size. The coefficients of interest are of the interaction terms of *Team* and *YEnd*, $b_1$, *YBeg*, $b_2$, *QEnd*, $b_3$, and *QBeg*, $b_4$. They show how different fund returns around the year-end and quarter-ends are from average returns during the rest of the year.[10]

## 2.2 Relationship between managerial structure and portfolio pumping

Table 2 shows the aggregate results of the portfolio pumping activity across funds with different managerial structures. It reports the end-of-year, beginning-of-year, end-of-quarter, and

[9] Taking the beginning-of-year managerial structure data precludes the look-ahead bias in our estimations. We assume that the beginning-of-year *t* managerial structure is identical to that on the last day of year *t*-1.

[10] Unlike Carhart et al. (2002), we account for correlation among fund returns by clustering at the fund level. Our results remain unaffected by an additional clustering by time.

beginning-of-quarter coefficients and their corresponding *p*-values (in parentheses) for single-managed funds, across all team-managed funds, and separately for funds with various team sizes. Thereafter, the standard errors are double-clustered by fund and year. Panel A of Table 2 shows test results without fund controls. Consistent with Carhart et al. (2002) and others, we find strong evidence of portfolio pumping around both the year-end and quarter-ends. Importantly, the most profound evidence of this seasonal trading activity is observed in single-managed funds. Their average daily excess returns at the year-end and quarter-ends differ from their returns during the rest of the year by 20bps and 16bps, respectively. The corresponding return differences among team-managed funds are lower by 9bps and 4bps. This implies that team-managed funds earn about 45% (20%) lower returns on the last day of the year (quarter) compared to single-managed funds. We observe a similar pattern for the beginning-of-year and beginning-of-quarter returns. These returns for single-managed funds differ from those for the rest of the year by -20bps and -13bps, respectively, but are less negative for team-managed funds.

The magnitude of portfolio pumping decreases with an increase of the number of fund managers in a team. For example, two-manager funds exhibit -7bps and 3bps differences as compared to single-managed funds for the end-of-year and beginning-of-year daily returns, respectively. However, the corresponding differences for the funds with four or more managers are substantially larger, standing at -10bps and 9bps, respectively. This implies that the funds with four or more managers experience about 50% lower returns on the last day of the year and 45% higher returns in the first day of the year than the funds with only one manager.

In Panel B of Table 2, we include standard fund and fund family controls into regression model (1). Note that these variables should not materially change our coefficients on the last and first trading days of the year and quarters, as these characteristics are at the annual frequency, while we estimate daily returns. Indeed, the results in this panel are qualitatively similar to those reported in Panel A of Table 2.

Finally, in the last two panels of Table 2 we also report the estimation results using the Daniel, Grinblatt, Titman, and Wermers (1997) return adjustment (Panel C without controls and Panel D with controls). The outcomes of these tests are identical to those in Panels A and B of Table 2. We again observe that team-managed funds exhibit significantly less evidence of portfolio pumping, and that the reduction in portfolio pumping increases with an increase in team size.

During our sample period, there were many changes in the managerial structure of funds. In their study of the determinants of managerial structure in the mutual fund industry, Patel and Sarkissian (2017) show that fund performance plays a role in the fund family's choice of managerial structure for their funds. In particular, poor long-term past performance of single-managed funds pushes fund families to change the single-managed managerial structure of these funds to the team-managed one. Patel and Sarkissian (2017) also find that, at the margin, other factors, such as fund size and flows, may affect the choice of managerial structure. While we consider the relationship between changes in managerial structure and portfolio pumping in detail in Section 2.3, now we want to repeat our tests in Table 2 for only those funds that did not experience any changes in their managerial structure. These tests should reveal whether the evidence documented in Table 2 is driven by the funds where the number of portfolio managers changed.

Table 3 presents the results of the tests on portfolio pumping activity only for the funds with constant managerial structure over the entire sample period. As in Table 2, Panels A and B of Table 3 report the estimations without and with fund controls, respectively. The overall pattern of the results is very similar to that in Table 2. Specifically, we observe that (i) team-managed funds have a significantly weaker evidence of both year-end and quarter-end portfolio pumping activity; and (ii) the extent of this evidence is positively related to team size. As before, larger teams of four or more managers show the lowest inclination for inflating the end-of-reporting-period returns.

Therefore, the results in Tables 2-3 show that the propensity of fund managers to artificially inflate returns at the end of reporting periods substantially decreases when managers are a part of a team – particularly, in teams of four or more managers. Importantly, this reduction is not a characteristic of any one fund investment objective and is immune to the inclusion of standard fund controls.

Finally, we examine how teams impact the extent of portfolio pumping across funds with different performances (see Figure 2).[11] Figure 2 shows fund returns around the year-end depending on fund performance separately for single-managed and team-managed funds. The upper and the lower plots show daily excess fund returns on the last and the first trading day of the year, respectively. Fund performance is measured from the first trading day of the year to the second-to-last day of the same year and is split into 20 performance bins by 5% each. In line with Carhart et al. (2002) and Ben-David et al. (2013), we find a U-shaped pattern between the end-of-year returns and fund performance for the sub-samples of both single-managed and team-managed funds. We also observe an increasing relation between the beginning-of-year returns and fund performance that somewhat flattens out after the 50$^{th}$ percentile of performance. However, in some contrast to Carhart et al. (2002), we find that portfolio pumping is more profound not for high-performing funds, but for the funds with the lowest yearly performance. This difference is significant. For example, across all funds, while excess positive returns at the year-end are about 40bps for the worst-performing funds, the best-performing funds have excess positive returns of 30bps. A similar pattern emerges for the year-beginning: the returns are markedly lower among the worst-performing funds (less than -30bps for the bottom 15$^{th}$ percentile of performance) than their best-performing counterparts (only about -12bps). However, substantial evidence of year-end return manipulation among high-performing funds indicates, as

[11] Similar to Carhart et al. (2002), we also use cross-sectional tests to see whether the relationship between the fund's subsequent returns over any two trading days is more negative on the first day of the year and quarter. Consistent with the earlier evidence, we show a more reverse relationship for these days. The results are available upon request.

also concluded in earlier studies, that the funds with a very high likelihood of being classified as top performers have sufficient incentives to increase that possibility.[12]

More interesting for our analysis are the differences in portfolio pumping between single-managed and team-managed funds. As we can see in the results, for any fund performance bin, the year-end returns are higher for single-managed funds than for team-managed ones. The same pattern (but with a minus sign) holds throughout almost all performance bins for the year-beginning returns: these returns are less negative for team-managed funds than for single-managed ones in all but one of the middle performance bins (namely, the 45$^{th}$ percentile bin). We also observe that the largest extent of portfolio pumping occurs among the worst-performing single-managed funds. This finding can be explained as follows. Managers of single-managed funds, who anticipate that their funds will fall into the lowest performance percentiles, have very strong incentives to make their returns look better, on the one hand, and, on the other hand, are under a relatively low pressure to not get involved in any form of unethical or illegal trading behaviour. Accordingly, for these types of funds, the cost of cheating (e.g., probability of being caught) versus the benefit from it (e.g., improved fund performance, increased inflows) is much lower than for analogous team-managed funds. Therefore, when single-managed funds are successful in deceiving the public, they can enjoy all the benefits of their unethical actions themselves, while, in team-managed funds, team members share such benefits. In addition, while the risks of being caught with illegal trading activity, *ceteris paribus*, must be equal across all funds, the cost of cheating in team-managed funds is still higher than in single-managed ones due to, for instance, the risk of conspiracy charges if illegal trading becomes known.

### 2.3 Changes in managerial structure and portfolio pumping

[12] The evidence of more severe portfolio pumping among low-performing funds is sample-specific. In unreported results, we replicate Figure 2 for all funds using a reduced sample period ending in December 2010. In this sample, the magnitude of portfolio pumping is almost identical for both high-performing and low-performing funds.

Our previous results show a connection between the managerial structure of funds and their likelihood of getting involved in illegal trading activities. However, the decision whether a fund is managed by a team or an individual is often endogenous, which makes it difficult to make a causal statement about the impact of teams on portfolio pumping.

To establish a causal link, we examine how changes in the managerial structure of funds from single- to team-management and vice versa affect portfolio pumping. We study fund switches in managerial structure in two different ways. First, we compare the difference in the magnitude of portfolio pumping before and after the change in a fund's managerial structure, while controlling for observable fund and family characteristics. Second, we compare the magnitude of portfolio pumping across a group of mutual funds that switched from single- to team-managed and vice versa (treated group) with a group of otherwise similar funds that did not switch (control group). To perform this test, we identify all instances of the funds that change their managerial structure. Using the propensity score matching, we create a control group that most closely resembles our treated group. We use logistic regressions and identify the funds with fund characteristics similar to those of the funds in the treated group. Each fund that switched its managerial structure is matched to a fund with the closest propensity scores based on fund size, fund age, past performance, family size, and fund turnover. To account for the time effect, each treated fund is matched with a control fund in the same period. We cluster the standard errors by fund and time. Our matching approach helps us to examine the differential effect of team-management on portfolio pumping across "treated" funds and their "counterfactuals".

Our empirical specification is as follows. We replace the *Team* dummy in Eq. (1) with the managerial structure change variable (see Eq. (2)).

$$\begin{aligned} r_{i,t} = {} & b_0 + b_1 YEnd_t \times \Delta MS_{i,t-1} + b_2 YBeg_t \times \Delta MS_{i,t-1} + b_3 QEnd_t \times \Delta MS_{i,t-1} + \\ & + b_4 QBeg_t \times \Delta MS_{i,t-1} + b_5 MEnd_t \times \Delta MS_{i,t-1} + b_6 MBeg_t \times \Delta MS_{i,t-1} + \\ & + b_7 YEnd_t + b_8 YBeg_t + b_9 QEnd_t + b_{10} QBeg_t + b_{11} MEnd_t + b_{12} MBeg_t + \\ & + b_{13} \Delta MS_{i,t-1} + \boldsymbol{\delta} Fund\_Controls_{i,t} + \boldsymbol{\gamma} Year\_FE_t + e_{i,t} \end{aligned}, \qquad (2)$$

where $\Delta MS_{i,t-1}$ is a dummy which is equal to one if fund *i* changed its structure from single- to team-management (or vice versa in a separate estimation) at the *beginning* of year *t*, and zero otherwise. The coefficients of interest are on the interaction terms of $\Delta MS$ and *YEnd*, $b_1$, *YBeg*, $b_2$, *QEnd*, $b_3$, and *QBeg*, $b_4$. Consistent with our main hypothesis, we argue that, as funds become team-managed (single-managed), their portfolio pumping activity decreases (increases).

Table 4 shows the effects of changes in managerial structure on portfolio pumping based on Eq. (2). The first two columns show the changes from single- to team-management. We perform two estimations. The first column reports the results only for those funds that switched from single- to team-management – that is, we compare the daily excess returns of the funds that switched from being single-managed to being team-managed after the switch. The second column compares the estimates of the funds that switched from single- to team-management with those that remain single-managed throughout the sample period. Under both specifications, we find very strong economic and statistical support for our earlier conclusion –namely, that team-managed funds do less portfolio pumping at both the year-ends and quarter-ends. For example, after switching from single- to team-management, funds post about 67% lower year-end returns as compared to what they had prior to the switch, which was 21bps. The year-end return drop with respect to other single-managed funds is also very large, standing at approximately 60%.

The last two columns of Table 4 show the estimates for the changes from team- to single-management. Again, the first of these two columns compares the pumping propensity of funds after the switch with their own data prior to the switch, while the second column projects the difference to all other funds that maintained their team-based structure. Given that, in our sample period, considerably more funds became team-managed than single-managed, our sample size in the third column is markedly smaller than that in all other estimations. In general, we observe an increase in the extent of portfolio pumping as funds become single-managed, particularly with regard to the same funds at quarter-ends. Therefore, the results in Table 4 provide some causal

evidence of a link between the managerial structure of funds and their likelihood of engaging in portfolio pumping.

## 3. Managerial Structure and Flow-Performance Relationship

### 3.1 Flow-performance relationship in single-managed and team-managed funds

Several previous studies have documented the convexity of the flow-performance relationship in U.S. equity funds (Chevalier and Ellison, 1997; Sirri and Tufano, 1998; Del Guercio and Tkac, 2002; Berk and Green, 2004; Huang, Wei, and Yan, 2007). These studies show that mutual fund flows react asymmetrically to past fund performance: specifically, the funds with better performance receive greater inflows, while the funds with poor performance do not experience significant outflows. In this section, we revisit this evidence, focusing on possible discrepancies in the extent of the convexity of the flow-performance relationship between single-managed and team-managed funds.

The motivation for this analysis stems from the premise that the *same* performance of a fund is differently rewarded by investors depending on whether the fund is single-managed or team-managed. Indeed, star managers often receive much more attention in the press than well-performing funds managed by teams of portfolio managers. In addition, people tend to associate achievements and failures with individuals, rather than with groups of people involved in decision making.

We visualize the flow-performance relationship for single- and team-managed funds in Figure 3, which consists of four plots. The horizontal axis in each plot contains the quintiles of the past year fund performance (1 is the worst and 5 is the best) based on raw returns, and the vertical axis shows the median of the current year net fund flows as a percentage. Each plot has two curves. One curve, which is identical in all plots, shows a highly convex flow-performance relationship in single-managed funds. The second curve on Plot A represents the convexity of the

flow-performance relationship for all team-managed funds, while the second curve on Plots B, C, and D represents the convexity for funds with two, three, and four or more managers, respectively. We observe that, for the highest past performance quintile, the net flows to team-managed funds are markedly lower than those to single-managed funds. Note that this difference in net flows is the biggest for the funds managed by large teams (four or more managers).

To systematize our observations in Figure 3 in statistical terms, we adjust the methodology of Sirri and Tufano (1998) and others to our setting and test the following flow-performance specification (see Eq. (3)):

$$\begin{aligned} Flows_{i,t} = {} & b_0 + b_1 HighPerf_{i,t-1} \times Team_{i,t-1} + b_2 MidPerf_{i,t-1} \times Team_{i,t-1} + \\ & + b_3 LowPerf_{i,t-1} \times Team_{i,t-1} + b_4 HighPerf_{i,t-1} + b_5 MidPerf_{i,t-1} + \\ & + b_6 LowPerf_{i,t-1} + b_7 Team_{t-1,i-1} + \boldsymbol{\delta} Fund\_Controls_{i,t} + \boldsymbol{\gamma} Year\_FE_t + e_{i,t} \end{aligned}, \qquad (3)$$

where $Flows_{i,t}$ are the net flows of fund *i* at time *t*. $HighPerf_{i,t-1}$, $MidPerf_{i,t-1}$, and $LowPerf_{i,t-1}$ stand for, respectively, the highest, middle two, and lowest performance quartiles of fund *i* at time *t*-1.[13] The fund controls in Eq. (3) setting include fund size, age, fees, and fund family size, all of which are in Model (1) as well, plus fund return volatility and fund category flows. We choose the fund controls following the previous literature. The coefficients of primary interest are $b_1$ and $b_2$. If the flow-performance relationship is less convex for team-managed funds than for single-managed ones, then $b_1$ should be negative, and $b_2$ should be positive; conversely, if the relationship is more convex, then $b_1$ should be positive, and $b_2$ should be negative.

Similarly to several previous studies, including Sirri and Tufano (1998), and Huang, Wei, and Yan (2007), we estimate Model (3) using Fama and MacBeth's (1973) regressions. The results are in Table 5. This method is more robust than panel regression, since there are no concerns about correlated in time standard errors. The first two columns provide the estimates for

[13] More precisely: $LowPerf_{i,t-1}$ = min(0.25, $Rank_{i,t-1}$), $MidPerf_{i,t-1}$ = min(0.5, $Rank_{i,t-1} - LowPerf_{i,t-1}$), and $HighPerf_{i,t-1} = Rank_{i,t-1} - MidPerf_{i,t-1} - LowPerf_{i,t-1}$. Here *Rank*, which ranges between 0 and 1, is the fund's fractional performance rank. It is the fund's percentile performance (measured by raw returns) relative to that of other funds with the same investment objective within the same period.

the entire sample without (Column 1) and with (Column 2) fund controls. First, we clearly see a strong convex flow-performance relationship for single-managed funds. The coefficient on non-interactive *HighPerf* is positive, very large and highly significant, indicating the influx of new money with the fund's prior superior performance. The coefficient on *MidPerf* is also positive and significant, but much smaller in magnitude than that on *HighPerf*. The coefficient on *LowPerf* is negative and significant, indicating investors' reluctance to withdraw money from funds at times of poor performance. Most importantly, we observe that coefficient $b_1$ on *HighPerf* × *Team* is negative, large in absolute value and highly significant, while coefficient $b_2$ is positive and significant. This implies that the convexity of the flow-performance relationship for high past-performing team-managed funds is significantly weaker than that for single-managed funds. However, as shown by coefficient *LowPerf* × *Team*, the differences in net fund flows between team-managed and single-managed funds for low past performance bins is statistically insignificant. Columns 3-5 show how the size of the team impacts the flow-performance relationship. We see that large teams (of four managers or more) have a less convex flow-performance relationship than small teams (of two managers).[14]

Taken together, our findings in Figure 3 and Table 5 suggest that the superior performance of team-managed funds is significantly less rewarded with new money inflows from investors than that of their single-managed counterparts. Moreover, using a much more limited data sample, we find that the convexity of the flow-performance relationship decreases (increases) as funds move from single- (team-) management to team- (single-) management (data available upon request). Therefore, for a given level of deceptive trading activity, team-managed funds gain less than single-managed funds. Along with the positive effects of peer monitoring and reduced monetary incentives within team-based organizational structures, this investing

[14] In unreported test available on request, we apply a panel regression framework to Model (3), and the results are qualitatively similar to those in Table 5.

behaviour of mutual fund clientele could certainly inhibit fund managers' inclination for portfolio pumping.

### 3.2 Peer effects versus flow-performance relationship in team-managed funds

The observed less convex relationship between past fund performance and current flows in team-managed funds raises an obvious question. What is the more dominant or widespread cause for the reduction of portfolio pumping in these types of funds: peer effects or a flatter flow-performance link?

To answer this question, we examine whether teams matter for portfolio pumping after controlling for the differences in convexity of the flow-performance relationship between single- and team-managed funds. To this end, we condition our analysis on past fund performance ranking. If portfolio pumping in team-managed funds is lower than in single-managed funds outside the best past performing funds, then peer effects are in place. Indeed, since there is no significant difference in the convexity of the flow-performance relationship for low performing funds (see Table 5), then any reduction in portfolio pumping in these team-managed funds can be directly attributed to the peer effects of teams.

Relevant results are in Table 6 that reports panel regression coefficients of daily excess fund returns on managerial structure depending on past fund performance: the top quartile, the middle two, and the bottom quartile. The methodology is similar to the one used to obtain the results in Table 2. All tests are with fund controls, including fund size, age, turnover, past performance, fees, as well as fund family size. Panel A of Table 6 reports the overall results. We can see that, across all funds, irrespective of their past performance ranking, team-managed funds show less portfolio pumping at both year-ends and quarter-ends. Yet, in line with the intuition, portfolio pumping is about 50% larger for top 25% past performing funds, where, besides the peer effects of teams, the lower convexity of flow-performance relationship could additionally contribute to less desire of team-managed funds to inflate their end-of-period fund returns.

Unfortunately, due to the lack of detailed data on intra-team interactions and actual compensation of teams in mutual fund industry, we are unable to further disentangle this effect to provide a full answer to the posed question.

Panel B in Table 6 reports test results depending on team size. For convenience, we split teams into small (fewer than four managers) and large (four or more managers). Other things equal, larger teams should have stronger peer effects. In accordance with this logic, we observe that the magnitude of portfolio pumping reduction is larger for large teams across all past fund performance quartiles and both for year-ends and quarter-ends (with the only exception at the year-end for the bottom 25% quartile of past fund performance). Therefore, we can conclude that mutual monitoring and joint monetary incentives in team-based organizational structures help to lower portfolio pumping intensity in team-managed mutual funds irrespective of their past performance. The observed flatter flow-performance relation in team-managed funds per se should also lead to lower portfolio pumping; however, this effect is present only among top past performing funds.

## 4. Alternative Views of Less Portfolio Pumping in Team-Managed Funds

### 4.1 Fund governance quality

One alternative explanation for the observed reduction in deceptive trading in team-managed funds may be systematic differences in fund governance between team- and single-managed funds. Intuitively, the funds with stronger internal governance mechanisms and oversight should be less likely to engage in deceptive trading practices – particularly, illegal practices such as portfolio pumping. To test this intuition, we use fund board size and the proportion of independent directors in the fund board as direct measures of fund governance.

We hand collect the information about board size and the proportion of independent directors in the board from the Statement of Additional Information (SAI), which is part of a fund's prospectus (Form 485BPOS) from 1995 to 2015. Every calendar year, funds disclose the

details of all directors (or trustees) affiliated with the fund and the fund's sponsor. We measure board size as the total number of directors serving on the board responsible for monitoring the fund. Following the SEC 2004 regulation, we define independent directors as those who are not current employees of the fund or of the fund sponsor; or do not own 5% or more shares of a registered broker-dealer, and are not affiliated with legal counsel to the fund. The primary role of independent fund directors is to mitigate conflicts of interest between fund sponsors and shareholders. In total, we have collected board-related information from 1,155 unique fund sponsors over the entire sample. We hand match fund level board size and ratio of independent director information with funds in our sample.

The test results on portfolio pumping activity for the sub-samples of funds with strong and weak governance are shown in columns 1-4 of Panel A (Table 7). Strong (weak) fund governance is proxied by the Big (Small) fund board size (columns 1-2) and High (Low) percent of independent directors (columns 3-4) with the corresponding samples split at the median. We find the presence of portfolio pumping activity in funds with different governance settings, irrespective of their managerial structure. Specifically, we observe that portfolio pumping occurs significantly more frequently among single-managed funds, as compared to team-managed funds, even among the funds with strong governance mechanisms (columns 1 and 3).[15]

Thus, our results refute the fund governance explanation. Fund boards are largely ineffective in preventing portfolio pumping, since they oversee multiple funds and do not observe day-to-day activities of fund managers. In fact, the SEC emphasizes that, in order to fulfill their oversight role effectively, fund directors should not be involved in day-to-day management

[15] Adams, Sattar, and Nishikawa (2010) show that funds which belong to larger fund families (based on the TNAs under management) tend to have stronger governance due to larger boards, non-unitary boards, and a higher proportion of independent directors on boards. Moreover, larger fund families have more resources dedicated to monitoring and compliance activities compared to smaller fund families (Ding and Wermers, 2013). Based on this logic, we expect funds belonging to larger fund families to have stronger governance and hence engage in less portfolio pumping activity, irrespective of their managerial structure. Using fund family size as an indirect fund governance proxy leads to the same outcome as in Panel A of Table 7. These results are available on request.

activities of funds. Team-management provides an additional layer of monitoring, particularly when fund managers engage in hidden or hard-to-measure activities. This form of monitoring is effective, because peers often have better information about coworkers than external monitors (e.g., board of directors) do, since members of the same group observe each-other actions in real-time. Therefore, team-management helps to alleviate the monitoring weakness of the fund board.

**4.2 Career concerns of managers**

Chevalier and Ellison (1999) show that younger fund managers are more concerned with their careers and performance. Theoretically, career concerns can have two opposite effects on younger fund managers' involvement in deceptive investment practices. On the one hand, younger fund managers may have fewer incentives for deceptive investment practices, since the costs of illegal trading are far greater for them than for more experienced professionals. On the other hand, in order to stand out from the crowd, younger managers may be more willing to take additional risks and engage in deceptive activities. To test the impact of career concerns on portfolio pumping, we use fund manager tenure within the mutual fund industry as a proxy for the standing of a fund manager within his/her career path. Managers with below (above) median fund industry experience are regarded as having high (low) career concerns. Manager industry experience (in years) is the difference between the current year and the first year managing a fund reported in Morningstar Direct. The median industry experience in our sample is 15.5 years.

Columns 3-4 in Panel A of Table 7 report the estimation results for fund managers with high and low career concerns, respectively. We find portfolio pumping activity among funds with both more experienced and less experienced portfolio managers. As before, the strongest evidence of portfolio pumping is among single-managed funds, while team-managed funds significantly reduce the extent of year-end and quarter-ends pumping in both high and low career concerns samples. However, the reduction in portfolio pumping at the year-ends from team-management is particularly strong for managers with high career concerns (less experience):

specifically, the team effect is almost 50% higher than that for managers with low career concerns. The quarterly results are similar to those around the year-ends. These estimates imply that career concerns do not significantly affect the propensity for deceptive trading.

### 4.3 Local networks, fund family policies, and the SEC enforcement

There are several other possible explanations for team-managed funds showing less proneness to portfolio pumping. These include different networking and information collecting opportunities across localities, variations in fund family administrative policies, and changes in government regulations. We address these issues in the tests presented in Panel B of Table 7. First, Christoffersen and Sarkissian (2009) show that larger cities, which provide better information generation and learning opportunities than smaller towns, positively impact fund manager performance over time. Therefore, different cities may have different cultures among their resident fund managers in collecting, disseminating, and reporting information. To account for this effect, we incorporate city fixed effects in column 1 of Table 7. This addition does not change the pattern of the results. As before, team-managed funds show significantly less portfolio pumping at the year-end and quarter-ends.

Second, fund families have different reporting and administrative structures that extend beyond specific portfolio manager(s). For example, fund families differ in terms of their trade reporting, operational channels, or information technology systems. All these possible variations result in inherent differences across fund families in terms of the likelihood of portfolio managers showing a propensity for deception. To account for such unobserved family characteristics, we include the fund family fixed effects into our estimation. The results are shown in column 2 of Panel B (Table 7). The outcome of this regression is again similar to the earlier tests: fund family fixed effects do not qualitatively alter our conclusion that there is significantly less portfolio pumping among team-managed funds.

Finally, as we mentioned earlier, it is believed that since 2001 the SEC has been more vigilant about illegal trading activities.[16] Therefore, the contribution of teams to decreasing portfolio pumping could reflect the more stringent U.S. government regulations since 2000s as well as the increasing proportion of team-managed funds after 2000 (Patel and Sarkissian, 2017). Therefore, the last column of Panel B (Table 7) includes a new control variable – the portfolio pumping case intensity (PP Case Intensity) to account for changes in the SEC's stringency over time for this illegal trading practice.[17] We measure PP Case Intensity by the percentage of portfolio pumping cases undertaken by SEC in the past year. The outcome of this estimation is quite remarkable, as it shows that the SEC enforcement does not materially affect our results. The estimates of coefficients on *YEnd*, *YBeg*, *QEnd*, and *QBeg* as well as on their interactive terms with the *Team* dummy are almost identical to those computed earlier.

### 4.4 Other potential explanations

Finally, we consider three possible fund characteristics that can be, to some extent, conductive to portfolio pumping and, therefore, potentially affect the extent of managerial structure impact on this phenomenon. These three characteristics include fund illiquidity, portfolio concentration, and active share. *Ceteris paribus*, it is easier for a fund to engage in portfolio pumping if its portfolio is less liquid, more concentrated, or has a larger active share defined by Cremers and Petajisto (2009).[18] Indeed, the only purpose of portfolio pumping for fund managers is to be able to inflate the prices of securities that are part of their holdings.

[16] We note that no study establishes a direct relation between the SEC enforcement and portfolio pumping.
[17] We hand collect enforcement actions from the SEC litigation releases and the SEC's website. We obtain the data on market manipulation cases from the table titled "*Enforcement Cases Initiated by the Commission*" under the program area of "*Market Manipulation*". We find a total of 883 market manipulation cases over our sample period. Market manipulation cases include cases on activities such as "pump and dump" schemes, wash trading, and portfolio pumping among others. The SEC does not explicitly report the number of portfolio pumping cases every year in any of its annual publications. Therefore, we screen all 883 market manipulation cases and search for phrases such as "portfolio pumping," "marking the close," "marked the close," "painting the tape," or "leaning for the tape". Following this methodology, we identify 32 distinct portfolio-pumping cases during our sample period.
[18] We thank the anonymous referee for bringing this issue to our attention.

Clearly, it is easier to achieve this with more illiquid stocks, but it is problematic to do so with equity of well-traded firms. Similarly, when fund holdings are not very diffused, the price pressure from trading in specific stocks is larger. Finally, the incentive and impact of stock pumping is higher when the percentage of stock holdings in a manager's portfolio substantially differs from the fund's benchmark index.

We address these concerns in Panel C of Table 7. This panel shows the effects of fund illiquidity, portfolio concentration, and active share on portfolio pumping. Fund illiquidity is based on the Amihud (2002) measure. Fund portfolio concentration is based on the industry concentration index (ICI) and follows Kacperczyk, Sialm, and Zheng (2005). Fund active share is based on the Cremers and Petajisto (2009) measure. We split each of these three fund characteristics by the median into high and low sub-samples and repeat our estimation based on regression model (1). Consistent with the intuition discussed above, we find more evidence of portfolio pumping at the year-, quarter-, and month-ends when the fund's portfolio is less liquid, more concentrated, or has a larger active share. For instance, the magnitude of coefficients on *YEnd* and *QEnd* , as well as on *YBeg* and *QBeg*, are substantially larger for the respective "high" sub-samples than "low" in almost all cases. These coefficients indicate more profound portfolio pumping among single-managed funds that are more illiquid, more concentrated, or have larger active shares. Yet, the corresponding interactive terms, *YEnd* × *Team* and *QEnd* × *Team*, are negative and significant throughout, while *YBeg* × *Team* and *QBeg* × *Team* are positive and also mainly highly significant. This implies that team-management is associated with reduced portfolio pumping irrespective of the fund's portfolio illiquidity, concentration, or active share.

## 5. Robustness Tests

### 5.1 Alternative portfolio pumping measure

Bernhardt and Davies (2005) propose an alternative methodology for the detection of portfolio pumping. Instead of measuring returns separately at the end and at the beginning of

year, quarter, and month, they define year-end, quarter-end, and month-end abnormal returns. The year-end abnormal return is the turn of year difference between the beginning-of-year and end-of-previous-year returns; the quarter-end abnormal return is the turn of quarter difference between the beginning-of-quarter and end-of-previous-quarter returns; the month-end abnormal return is the turn of month difference between the beginning-of-month and end-of-previous-month returns.

Table 8 presents the estimation results based on the adjustment to Eq. (1), where the dependent variable is replaced with abnormal returns defined as in Bernhardt and Davies (2005), while all calendar time contained independent variables are replaced with year-end, quarter-end, and month-end dummies (*YEnd_BD*, *QEnd_BD*, and *MEnd_BD*, respectively). The fund controls and other regression specifics are similar to those in Table 2. As before, we observe a greater prevalence of portfolio pumping at the turns of the year and quarters among single-managed funds and a drastic reduction in this activity among team-managed funds. Again, similar to the results in Table 2, we also observe a decrease in portfolio pumping with an increase of team size. The difference in the reduction in pumping between two- and multi-manager funds (four or more managers) is almost two-fold. Therefore, using the Bernhardt and Davies's (2005) methodology yields the same outcome – namely, team-management is useful in alleviating fund managers' propensity for engaging in portfolio pumping.

### 5.2 Exact date changes in managerial structure of funds

The final issue that we consider is rerunning our main tests by taking into account the exact dates of managerial structure changes, rather than by taking fund records at the end of the previous year. Table 9 shows the estimation results without (Panel A) and with (Panel B) fund controls, exactly as in Table 2. In these tests, *Team* is an indicator variable that equals one if the fund has two (or more) fund managers at a given date within the estimation year, and zero otherwise. The tests in Panel A have no fund controls. The tests in Panel B include fund controls,

including fund size, age, turnover, past performance, fees, and fund family size. Our estimation results remain the same; in fact, they are even slightly stronger in economic terms. We should note that, while the information on exact managerial structure changes is available, the information on most other fund characteristics is available only at annual frequency.

## 6. Conclusions

In this paper, we focus on U.S. domestic equity mutual funds and examine the extent of portfolio pumping – an illegal trading practice of inflating year-end and quarter-end portfolio returns – across funds with different managerial structures. Portfolio pumping is very costly to both capital markets and investors, as it moves stock prices away from their fundamental values, thereby increasing the risks of significant future equity market declines. However, it is very difficult for fund boards to control day-to-day fund trading activities and for financial regulators such as the SEC to prosecute and legally convict fund managers of manipulating fund returns. We show that team-managed funds are less likely to engage in dishonest fund performance-enhancing activities. Therefore, team-management can be viewed as a desirable organizational structure that reduces the weaknesses of the fund board and SEC in controlling, identifying, and penalizing portfolio pumpers.

The average daily excess returns of single-managed funds at the end (beginning) of the year differ from their returns during the rest of the year by 20bps (-20bps). In contrast, team-managed funds post 45% lower and 20% higher returns on the last day and the first day of the year and quarters, respectively. Across all our tests, we document a negative relationship between the extent of portfolio pumping and team size. We also show that portfolio pumping activity is most evident among single-managed funds with the worst past performance. These cross-managerial structure results hold after controlling for various fund characteristics, including fund size, age, fees, turnover, flows, and fund family size. We also find reduction in portfolio pumping

in team-managed funds irrespective of the ease of pumping, i.e., among funds that are less liquid, more concentrated, or have higher active share.

We explain our findings by two mechanisms that decrease teams' incentives to cheat. The first is standard peer effects in teams, such as joint monitoring and joint sharing of profits that appear to be present across all team-managed funds, irrespective of their past performance. The second mechanism, relevant for specifically top past performing funds, is the less convex flow-performance relationship for team-managed funds than for single-managed peers. This implies limited economic gains for outperforming team-managed funds from artificially inflating their fund returns.

We find little evidence that alternative explanations – such as the differences in fund governance, reporting standards, manager career concerns, local networks, as well as the post-2001 more stringent monitoring of trading activities by the SEC – are responsible for the observed reduction of portfolio pumping in team-managed funds. Therefore, our results highlight an additional advantage of team-management in the fund industry, beyond its other benefits discussed in earlier studies.

## Appendix: SEC Cases Related to Portfolio Pumping

***Case 1:*** *Excerpted from Litigation Release No. 20046 / March 16, 2007*: *SEC v. Burton G. Friedlander et al., Civil Action No. 01 Civ. 4683 (KMW) (S.D.N.Y.).* [19]

On February 21, 2007, United States District Judge Kimba Wood entered final judgments by consent against Burton Friedlander and four entities he formerly controlled. These final judgments conclude the U.S. Securities and Exchange Commission's action, except for a final distribution by the court-appointed receiver.

The Commission filed its original complaint in May 2001, alleging fraud in connection with Friedlander's management of the assets of Friedlander International Limited, an overseas

[19] See details at http://sec.gov/litigation/litreleases/2007/lr20046.htm.

hedge fund. The Commission alleged that Friedlander inflated the hedge fund's net asset value by improperly and arbitrarily valuing certain unlisted securities of a company in which Friedlander and entities he controlled had heavily invested. The Commission's complaint also alleged that Friedlander engaged in "portfolio pumping" by purchasing a thinly traded common stock as part of a manipulative scheme to inflate the value of that stock and to inflate the hedge fund's net asset value…

***Case 2:*** *Excerpted from Litigation Release No. 21865 / February 25, 2011: SEC v. Todd M. Ficeto, Florian Homm, Colin Heatherington, Hunter World Markets, Inc., and Hunter Advisors, LLC et al., Case No. CV-11-1637 GHK (RZx) (C.D. Cal. February 24, 2011).* [20]

The Securities and Exchange Commission charged two securities professionals, a hedge fund trader, and two firms involved in a scheme that manipulated several U.S. microcap stocks and generated more than $63 million in illicit proceeds through stock sales, commissions and sales credits.

According to the SEC's complaint filed in the U.S. District Court for the Central District of California, Homm along with Ficeto and Heatherington conducted the scheme from September 2005 to September 2007… The SEC alleges that Florian Homm of Spain and Todd M. Ficeto of Malibu, Calif., conducted the scheme through their Beverly Hills, Calif.-based broker-dealer Hunter World Markets Inc. (HWM) with the assistance of Homm's close associate Colin Heatherington, a trader who lives in Canada. They brought microcap companies public through reverse mergers and manipulated upwards the stock prices of these thinly traded stocks before selling their shares at inflated prices to eight offshore hedge funds controlled by Homm. Their manipulation of the stock prices allowed Homm to materially overstate by at least $440 million the hedge funds' performance and net asset values (NAVs) in a fraudulent practice known as "portfolio pumping…"

[20] See details at http://sec.gov/litigation/litreleases/2011/lr21865.htm.

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**Table 1**
**Summary statistics of daily fund returns and other fund characteristics**

| | | | | | Team Size | | |
|---|---|---|---|---|---|---|---|
| | | All | Single | Team | 2 FM | 3 FM | 4+ FM |
| Daily Excess Return | Mean | 0.0072 | 0.0070 | 0.0074 | 0.0073 | 0.0072 | 0.0075 |
| | SD | 0.6170 | 0.6585 | 0.5869 | 0.5900 | 0.6073 | 0.5420 |
| Fund Size (mln, $) | Mean | 829 | 774 | 883 | 684 | 690 | 1,276 |
| | SD | 4,003 | 4,033 | 3,956 | 1,852 | 2,263 | 6,980 |
| Fund Turnover (%) | Mean | 66.4 | 75.0 | 60.7 | 63.3 | 61.2 | 54.0 |
| | SD | 74.7 | 82.3 | 68.7 | 70.1 | 72.2 | 62.6 |
| Fund Fees (%) | Mean | 1.236 | 1.271 | 1.214 | 1.248 | 1.215 | 1.154 |
| | SD | 0.424 | 0.459 | 0.398 | 0.412 | 0.380 | 0.384 |
| Fund Age (years) | Mean | 9.91 | 9.59 | 9.12 | 9.23 | 9.92 | 9.36 |
| | SD | 10.11 | 10.21 | 10.03 | 10.45 | 10.75 | 10.56 |
| Family Size (bln, $) | Mean | 18.52 | 27.65 | 12.35 | 11.51 | 10.85 | 15.4 |
| | SD | 56.53 | 80.1 | 30.36 | 24.69 | 23.2 | 42.63 |
| Fund Flows (%) | Mean | 39.8 | 42.3 | 38.2 | 39.8 | 38.6 | 35.2 |
| | SD | 194.6 | 197.2 | 192.9 | 196.5 | 188.6 | 187.1 |

This table reports the mean and standard deviation (SD) of daily returns of U.S. domestic equity mutual funds across various managerial structures and fund characteristics (Panel B) from January 2, 1992 to December 31, 2015. Based on the number of fund managers in Morningstar Direct, funds are put into two broad managerial structures: Single and Team. Funds with one fund manager are classified as Single; funds with more than one manager are classified as Team. Team Size represents funds with two, three, and four or more fund managers. Daily Excess Return is the daily excess fund return (in percent) computed as the difference between the daily net fund return and the daily S&P 500 index return. The fund investment objectives are Aggressive Growth, Growth, Growth & Income, and Equity Income; the last two are combined into Growth and Income category. Fund Size (millions, $) is the total net assets (TNA) under the management of the fund at the end of the year. Fund Turnover (in percent) is the minimum of aggregated sales or purchases of securities in a year divided by the average 12-month total net assets of the fund. Fund Fees (in percent) are the annual total expense ratio of the fund. Fund Age is the number of years from the inception of the fund. Family Size (billions, $) is the TNA under the management of the fund family at the end of the year. Fund Flows are the net growth in the TNA of funds (in percent), adjusted for prior year returns.

**Table 2**
**Effect of managerial structure on portfolio pumping activity**

Panel A: Net fund return (no fund controls)

| | | | Team Size | | |
|---|---|---|---|---|---|
| | Single | Team | 2 FM | 3 FM | 4+ FM |
| YEnd | 0.1931*** | -0.0891*** | -0.0662*** | -0.0837*** | -0.0970** |
| | (0.004) | (0.001) | (0.001) | (0.002) | (0.024) |
| YBeg | -0.1950*** | 0.0425** | 0.0251 | 0.0419** | 0.0855*** |
| | (0.001) | (0.021) | (0.113) | (0.041) | (0.003) |
| QEnd | 0.1597*** | -0.0412*** | -0.0273*** | -0.0440*** | -0.0645*** |
| | (0.000) | (0.001) | (0.009) | (0.001) | (0.001) |
| QBeg | -0.1298*** | 0.0388*** | 0.0290*** | 0.0376** | 0.0577*** |
| | (0.001) | (0.002) | (0.009) | (0.017) | (0.002) |
| Obs. | | 8,530,140 | 5,727,138 | 4,571,745 | 4,769,941 |

Panel B: Net fund return (with fund controls)

| | | | Team Size | | |
|---|---|---|---|---|---|
| | Single | Team | 2 FM | 3 FM | 4+ FM |
| YEnd | 0.1515** | -0.0672*** | -0.0549*** | -0.0700*** | -0.0813** |
| | (0.017) | (0.008) | (0.004) | (0.008) | (0.043) |
| YBeg | -0.1755*** | 0.0351** | 0.0187 | 0.0399** | 0.0677** |
| | (0.002) | (0.050) | (0.232) | (0.044) | (0.015) |
| QEnd | 0.1456*** | -0.0371*** | -0.0230** | -0.0450*** | -0.0586*** |
| | (0.000) | (0.000) | (0.011) | (0.000) | (0.000) |
| QBeg | -0.1145*** | 0.0390*** | 0.0290*** | 0.0391** | 0.0569*** |
| | (0.004) | (0.003) | (0.008) | (0.015) | (0.002) |
| Obs. | | 6,684,465 | 4,460,135 | 3,563,841 | 3,735,311 |

Panel C: Characteristic-adjusted fund return (no fund controls)

| | | | Team Size | | |
|---|---|---|---|---|---|
| | Single | Team | 2 FM | 3 FM | 4+ FM |
| YEnd | 0.1199*** | -0.0534*** | -0.0395*** | -0.0565*** | -0.0631*** |
| | (0.000) | (0.000) | (0.001) | (0.000) | (0.002) |
| YBeg | -0.0955*** | 0.0280*** | 0.0189** | 0.0250* | 0.0545*** |
| | (0.000) | (0.007) | (0.031) | (0.055) | (0.001) |
| QEnd | 0.0871*** | -0.0208*** | -0.0134*** | -0.0208*** | -0.0333*** |
| | (0.000) | (0.000) | (0.007) | (0.004) | (0.000) |
| QBeg | -0.0536*** | 0.0229*** | 0.0218*** | 0.0187* | 0.0309*** |
| | (0.001) | (0.001) | (0.001) | (0.052) | (0.001) |
| Obs. | | 5,968,488 | 3,967,588 | 3,115,144 | 3,283,819 |

**Table 2 (continued)**

Panel D: Characteristic-adjusted fund return (with fund controls)

| | | | Team Size | | |
|---|---|---|---|---|---|
| | Single | Team | 2 FM | 3 FM | 4+ FM |
| YEnd | 0.0977*** | -0.0453*** | -0.0339*** | -0.0505*** | -0.0578*** |
| | (0.001) | (0.002) | (0.004) | (0.001) | (0.004) |
| YBeg | -0.0808*** | 0.0206** | 0.0134 | 0.0206* | 0.0394*** |
| | (0.000) | (0.048) | (0.176) | (0.063) | (0.009) |
| QEnd | 0.0742*** | -0.0171*** | -0.0106** | -0.0185*** | -0.0280*** |
| | (0.000) | (0.001) | (0.020) | (0.004) | (0.000) |
| QBeg | -0.0454*** | 0.0226*** | 0.0198*** | 0.0206** | 0.0307*** |
| | (0.005) | (0.001) | (0.003) | (0.030) | (0.001) |
| Obs. | | 4,854,489 | 3,211,233 | 2,527,708 | 2,681,375 |

This table reports panel regression coefficients of daily excess fund returns on managerial structure using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. The regression model follows Eq. (1). The dependent variable in Panels A and B is the daily fund return (net of expenses) in excess of daily S&P500 index return. The dependent variable in Panels C and D is the characteristic-adjusted daily fund return from Daniel, Grinblatt, Titman, and Wermers (1997). Team is a dummy variable which equals one if the fund has two (or more) fund managers and zero otherwise at the beginning of calendar year; YEnd – the last trading day of year dummy; YBeg – the first trading day of the year dummy; QEnd – the last trading day of the quarter, that is, March, June or September dummy; QBeg – the first trading day of the quarter, that is, April, July or October dummy; MEnd – the last trading day of February, April, May, July, August, October, or November dummy; and MBeg – the first trading day of February, March, May, June, August, September, November, or December dummy. Panel A and C tests have no fund controls. Panel B and D tests are with fund controls, which include fund size, age, turnover, past performance, return volatility, fees, as well as fund family size. The coefficients reported in column 2 (under Single) are the excess daily returns of funds managed by single manager. The coefficients reported in columns 3-6 (under Team and Team Size) are the interaction terms of Team and YEnd ($b_1$), YBeg ($b_2$), QEnd, ($b_3$) and QBeg ($b_4$) which reflect the difference in excess daily returns of single- and team-managed funds for the given period. Each regression includes year fixed effects. The standard errors are double-clustered by fund and year. The *p*-values are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

**Table 3**
**Funds with the same managerial structure for the whole sample period**

Panel A: No fund controls

| | | | Team Size | | |
|---|---|---|---|---|---|
| | Single | Team | 2 FM | 3 FM | 4+ FM |
| YEnd | 0.1723** | -0.0773*** | -0.0579*** | -0.0865*** | -0.0925** |
| | (0.014) | (0.001) | (0.004) | (0.000) | (0.024) |
| YBeg | -0.1947*** | 0.0468* | 0.0336 | 0.0128 | 0.0905*** |
| | (0.002) | (0.088) | (0.253) | (0.595) | (0.009) |
| QEnd | 0.1461*** | -0.0227 | -0.0072 | -0.0106 | -0.0514* |
| | (0.001) | (0.252) | (0.677) | (0.604) | (0.060) |
| QBeg | -0.1427*** | 0.0213* | 0.0153 | 0.0097 | 0.0379** |
| | (0.001) | (0.089) | (0.217) | (0.494) | (0.016) |
| Obs. | | 2,897,059 | 1,860,985 | 1,649,976 | 1,747,308 |

Panel B: With fund controls

| | | | Team Size | | |
|---|---|---|---|---|---|
| | Single | Team | 2 FM | 3 FM | 4+ FM |
| YEnd | 0.1459** | -0.0719*** | -0.0591*** | -0.0836*** | -0.0765* |
| | (0.036) | (0.005) | (0.008) | (0.000) | (0.068) |
| YBeg | -0.1711** | 0.0334 | 0.0233 | 0.0054 | 0.0669* |
| | (0.012) | (0.242) | (0.501) | (0.796) | (0.058) |
| QEnd | 0.1352*** | -0.0233 | -0.0061 | -0.0173 | -0.0473** |
| | (0.004) | (0.176) | (0.713) | (0.347) | (0.046) |
| QBeg | -0.1349*** | 0.0235* | 0.0167 | 0.0139 | 0.0386** |
| | (0.004) | (0.063) | (0.128) | (0.374) | (0.022) |
| Obs. | | 2,008,546 | 1,265,008 | 1,145,874 | 1,222,828 |

This table reports panel regression coefficients of daily excess fund returns on the constant managerial structure using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. Here the sample includes only those single and team-managed funds that remained single-managed or team-managed throughout the sample period. The team size remains the same too. The regression model and all variables are defined in Eq. (1) and Table 2. The coefficients reported in the column 2 (under Single) are the excess daily returns of funds managed by single manager. The coefficients reported in the column 3-6 (under Team and Team Size) are the interaction terms of Team and YEnd ($b_1$), YBeg ($b_2$), QEnd, ($b_3$) and QBeg ($b_4$) which reflect the difference in excess daily returns of single- and team-managed funds for the given period. Each regression includes year fixed effects. The standard errors are double-clustered by fund and year. The *p*-values are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

**Table 4**
**Effect of changes in managerial structure on portfolio pumping**

| | Single- to Team Management | | Team- to Single Management | |
|---|---|---|---|---|
| | Same Fund | Other Single Funds | Same Fund | Other Team Funds |
| YEnd × ΔMS | -0.1429** | -0.1021** | 0.0800 | 0.0385 |
| | (0.022) | (0.014) | (0.203) | (0.257) |
| YBeg × ΔMS | 0.1027** | 0.0435 | -0.1345* | -0.0534 |
| | (0.013) | (0.142) | (0.057) | (0.104) |
| QEnd × ΔMS | -0.1128*** | -0.0598*** | 0.0957*** | 0.0348** |
| | (0.000) | (0.001) | (0.000) | (0.014) |
| QBeg × ΔMS | 0.1020*** | 0.0644*** | -0.0273 | -0.0197 |
| | (0.002) | (0.002) | (0.350) | (0.280) |
| YEnd | 0.2088*** | 0.1682*** | 0.0566 | 0.0858* |
| | (0.010) | (0.008) | (0.440) | (0.086) |
| YBeg | -0.2355*** | -0.1763*** | -0.0863 | -0.0862* |
| | (0.000) | (0.002) | (0.290) | (0.092) |
| QEnd | 0.2018*** | 0.1488*** | 0.0876* | 0.0897*** |
| | (0.000) | (0.000) | (0.097) | (0.002) |
| QBeg | -0.1547*** | -0.1171*** | -0.1241** | -0.0610* |
| | (0.001) | (0.004) | (0.010) | (0.095) |
| ΔMS | -0.0003 | 0.0013 | -0.0030 | -0.0002 |
| | (0.848) | (0.308) | (0.312) | (0.910) |
| Fund Controls | Yes | Yes | Yes | Yes |
| Constant | Yes | Yes | Yes | Yes |
| Obs. | 1,426,663 | 2,283,887 | 202,753 | 942,819 |

This table reports panel regression coefficients of daily excess fund returns on changes in managerial structure using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. The change in managerial structure is defined by the ΔMS dummy, which is equal to one if a fund has changed its structure from single- to team-management in columns 1-2 (from team- to single-management in columns 3-4), and zero otherwise at the beginning of the calendar year. Column "Same Fund" compares the daily excess returns of the funds that switched from being single-managed (or team-managed) to being team-managed (or single-managed). Column "Other Single Funds" (Other Team Funds) compares the estimates of funds that have switched from single- to team-management (team- to single-management) with other funds that remain single-managed (team-managed) throughout the sample period. The regression model and all other variables are defined in Eq. (2) and Table 2. Each regression includes year fixed effects. The standard errors are double-clustered by fund and year. The *p*-values are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

**Table 5**
**Flow-performance relation and managerial structure**

| | Whole Sample | | Team Size | | |
|---|---|---|---|---|---|
| | (1) | (2) | 2 FM | 3 FM | 4+ FM |
| HighPerf × Team | -0.8919** | -0.9678** | -0.8038** | -0.1844 | -2.0167** |
| | (0.023) | (0.020) | (0.050) | (0.386) | (0.018) |
| MidPerf × Team | 0.4400** | 0.2186*** | 0.1844*** | 0.0057 | 0.5792** |
| | (0.027) | (0.003) | (0.001) | (0.933) | (0.022) |
| LowPerf × Team | -0.4951 | 0.0532 | -0.1474 | 0.4036* | -0.3317 |
| | (0.404) | (0.646) | (0.332) | (0.089) | (0.256) |
| HighPerf | 2.9209*** | 2.6938*** | 2.6762*** | 2.6490*** | 2.6138*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| MidPerf | 0.1311** | 0.2748*** | 0.2783*** | 0.2761*** | 0.2883*** |
| | (0.035) | (0.000) | (0.000) | (0.000) | (0.000) |
| LowPerf | -0.6483* | 0.7409*** | 0.7274*** | 0.7782*** | 0.7267*** |
| | (0.085) | (0.000) | (0.000) | (0.000) | (0.000) |
| Team | 0.0353 | -0.0092 | 0.0213 | -0.0558 | 0.0748 |
| | (0.665) | (0.611) | (0.327) | (0.246) | (0.260) |
| Fund Size | | -0.1951*** | -0.1949*** | -0.1916*** | -0.1981*** |
| | | (0.000) | (0.000) | (0.000) | (0.000) |
| Fund Age | | -0.0616*** | -0.0721*** | -0.0644*** | -0.0564*** |
| | | (0.000) | (0.000) | (0.000) | (0.000) |
| Fund Fees | | -0.0963*** | -0.0823*** | -0.0770** | -0.0958*** |
| | | (0.001) | (0.002) | (0.013) | (0.005) |
| Volatility | | -0.9468 | -0.6784 | -0.7340 | -1.0261 |
| | | (0.125) | (0.115) | (0.121) | (0.135) |
| Family Size | | 0.0854*** | 0.0866*** | 0.0845*** | 0.0888*** |
| | | (0.000) | (0.000) | (0.000) | (0.000) |
| Category Flow | | 0.5733** | 0.6017*** | 0.3903** | 0.6891** |
| | | (0.032) | (0.010) | (0.028) | (0.039) |
| Constant | Yes | Yes | Yes | Yes | Yes |
| Obs. | 35,816 | 29,456 | 19,930 | 15,874 | 16,784 |

This table reports the Fama-MacBeth regression coefficients of annual net fund flows on lagged fund performance and managerial structure using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. The variables are: $LowPerf_{i,t-1} = \min(0.25, Rank_{i,t-1})$, $MidPerf_{i,t-1} = \min(0.5, Rank_{i,t-1} - LowPerf_{i,t-1})$, and $HighPerf_{i,t-1} = Rank_{i,t-1} - \min(LowPerf_{i,t-1} + MidPerf_{i,t-1})$. Here Rank, which ranges between 0 and 1, is the fund's fractional performance rank. It is the fund's percentile performance (measured by raw returns) relative to other funds with the same investment objective in the same period. Fund size, age, fees and family size are defined as in Table 2. Volatility is the total annual volatility of gross fund returns. Category flow is the net money flow to a given fund category. The *p*-values are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

**Table 6**
**Past fund performance ranking and portfolio pumping activity**

Panel A: Team-managed versus single-managed funds

| | Past Performance Ranking | | | | | |
|---|---|---|---|---|---|---|
| | Bottom 25% | | Middle 50% | | Top 25% | |
| | Single | Team | Single | Team | Single | Team |
| YEnd | 0.2253*** | -0.0648** | 0.1441** | -0.0558** | 0.1033 | -0.0925*** |
| | (0.001) | (0.023) | (0.010) | (0.032) | (0.253) | (0.007) |
| YBeg | -0.1751** | 0.0367 | -0.1682*** | 0.0300 | -0.1911** | 0.0438** |
| | (0.011) | (0.233) | (0.001) | (0.109) | (0.017) | (0.024) |
| QEnd | 0.1710*** | -0.0607*** | 0.1302*** | -0.0274** | 0.1532*** | -0.0346** |
| | (0.000) | (0.000) | (0.000) | (0.014) | (0.000) | (0.031) |
| QBeg | -0.1655*** | 0.0557*** | -0.0910*** | 0.0299*** | -0.1143** | 0.0405** |
| | (0.001) | (0.005) | (0.006) | (0.005) | (0.026) | (0.012) |
| Obs. | | 1,536,724 | | 3,368,327 | | 1,779,414 |

Panel B: Small teams versus large teams

| | Bottom 25% | | | Middle 50% | | | Top 25% | | |
|---|---|---|---|---|---|---|---|---|---|
| | Single | Small-T | Large-T | Single | Small-T | Large-T | Single | Small-T | Large-T |
| YEnd | 0.2255*** | -0.0722*** | -0.0383 | 0.1434** | -0.0435* | -0.0804** | 0.1015 | -0.0819*** | -0.1146** |
| | (0.001) | (0.005) | (0.434) | (0.011) | (0.055) | (0.039) | (0.260) | (0.008) | (0.030) |
| YBeg | -0.1751** | 0.0309 | 0.0664 | -0.1678*** | 0.0237 | 0.0520* | -0.1903** | 0.0265 | 0.1019*** |
| | (0.012) | (0.295) | (0.156) | (0.001) | (0.141) | (0.067) | (0.018) | (0.127) | (0.002) |
| QEnd | 0.1708*** | -0.0499*** | -0.1033*** | 0.1303*** | -0.0223** | -0.0430** | 0.1534*** | -0.0296* | -0.0501*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.025) | (0.011) | (0.000) | (0.078) | (0.008) |
| QBeg | -0.1655*** | 0.0458*** | 0.0872** | -0.0909*** | 0.0248** | 0.0416*** | -0.1146** | 0.0356** | 0.0567** |
| | (0.001) | (0.010) | (0.010) | (0.006) | (0.021) | (0.002) | (0.026) | (0.017) | (0.043) |
| Obs. | | 1,273,080 | 840,920 | | 2,699,635 | 1,903,271 | | 1,475,061 | 991,120 |

This table reports panel regression coefficients of daily excess fund returns on managerial structure depending on fund past performance using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. The regression model follows Eq. (1) conditional on past performance ranking. The dependent variable is the daily fund return (net of expenses) in excess of daily S&P500 index return. Team is a dummy variable which equals one if the fund has two (or more) fund managers and zero otherwise at the beginning of calendar year. The regression model and all other variables are defined in Eq. (1) and Table 2. Past Performance Ranking uses fund returns over the past twelve months. All tests are with fund controls, which include fund size, age, turnover, past performance, fees, as well as fund family size. Panel A reports the overall results. Panel B reports results depending on team size. Small-T is defined as a team with less than four fund managers. Large-T is defined as a team with at least four or more fund managers. The coefficients reported under Single are the excess daily returns of funds managed by a single manager. The coefficients reported under Team (or Small-T/Large-T) are the interaction terms of Team and YEnd ($b_1$), YBeg ($b_2$), QEnd, ($b_3$) and QBeg ($b_4$), which reflect the difference in excess daily returns of single- and team-managed funds for the given period. Each regression includes year fixed effects. The standard errors are double-clustered by fund and year. The *p*-values are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

**Table 7**
**Alternative explanations for less portfolio pumping in team-managed funds**

Panel A: Effects of fund governance and career concerns

| | Fund Board Size | | Independent Director (%) | | Career Concerns | |
|---|---|---|---|---|---|---|
| | Big | Small | High | Low | High | Low |
| YEnd × Team | -0.0783*** | -0.0547** | -0.0783*** | -0.0540** | -0.0792*** | -0.0526* |
| | (0.006) | (0.029) | (0.006) | (0.031) | (0.006) | (0.062) |
| YBeg × Team | 0.0365* | 0.0337* | 0.0303 | 0.0386** | 0.0518** | 0.0374** |
| | (0.065) | (0.077) | (0.132) | (0.042) | (0.016) | (0.035) |
| QEnd × Team | -0.0406*** | -0.0335*** | -0.0371*** | -0.0372*** | -0.0404*** | -0.0377*** |
| | (0.000) | (0.003) | (0.003) | (0.001) | (0.001) | (0.002) |
| QBeg × Team | 0.0388*** | 0.0401** | 0.0320** | 0.0467*** | 0.0493*** | 0.0350** |
| | (0.002) | (0.011) | (0.018) | (0.002) | (0.001) | (0.012) |
| YEnd | 0.1740** | 0.1285** | 0.1745*** | 0.1275** | 0.1500** | 0.1555** |
| | (0.011) | (0.037) | (0.007) | (0.050) | (0.023) | (0.012) |
| YBeg | -0.1779*** | -0.1731*** | -0.1817*** | -0.1691*** | -0.1953*** | -0.1730*** |
| | (0.002) | (0.003) | (0.001) | (0.004) | (0.001) | (0.002) |
| QEnd | 0.1494*** | 0.1417*** | 0.1452*** | 0.1460*** | 0.1516*** | 0.1436*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| QBeg | -0.1053*** | -0.1237*** | -0.1039*** | -0.1254*** | -0.1277*** | -0.1063*** |
| | (0.004) | (0.005) | (0.005) | (0.003) | (0.003) | (0.006) |
| Team | -0.0005 | 0.0011 | -0.0005 | 0.0007 | 0.0011 | -0.0002 |
| | (0.593) | (0.162) | (0.610) | (0.519) | (0.259) | (0.813) |
| Fund Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Constant | Yes | Yes | Yes | Yes | Yes | Yes |
| Obs. | 3,239,359 | 3,445,106 | 3,240,694 | 3,443,771 | 3,031,585 | 3,154,383 |

**Table 7 (continued)**

Panel B: Effects of local networks, fund family policies, and U.S. regulation change

| | Local Networks | Fund Family Policies | SEC Enforcement |
|---|---|---|---|
| YEnd × Team | -0.0661*** | -0.0672*** | -0.0672*** |
| | (0.009) | (0.008) | (0.008) |
| YBeg × Team | 0.0358** | 0.0349* | 0.0352** |
| | (0.048) | (0.051) | (0.049) |
| QEnd × Team | -0.0371*** | -0.0371*** | -0.0371*** |
| | (0.000) | (0.000) | (0.000) |
| QBeg × Team | 0.0398*** | 0.0391*** | 0.0390*** |
| | (0.002) | (0.003) | (0.002) |
| YEnd | 0.1504** | 0.1515** | 0.1515** |
| | (0.017) | (0.016) | (0.017) |
| YBeg | -0.1762*** | -0.1778*** | -0.1755*** |
| | (0.002) | (0.002) | (0.002) |
| QEnd | 0.1454*** | 0.1455*** | 0.1456*** |
| | (0.000) | (0.000) | (0.000) |
| QBeg | -0.1151*** | -0.1145*** | -0.1145*** |
| | (0.004) | (0.003) | (0.004) |
| Team | 0.0002 | 0.0003 | 0.0002 |
| | (0.819) | (0.589) | (0.784) |
| PP Case Intensity | | | -0.0017*** |
| | | | (0.005) |
| Fund Controls | Yes | Yes | Yes |
| Constant | Yes | Yes | Yes |
| City Fixed Effects | Yes | No | No |
| Family Fixed Effects | No | Yes | No |
| Obs. | 6,633,008 | 6,684,465 | 6,684,465 |

**Table 7 (continued)**

Panel C: Effects of fund illiquidity, portfolio concentration, and active share on portfolio pumping

| | Fund Illiquidity | | Portfolio Concentration | | Active Share | |
|---|---|---|---|---|---|---|
| | High | Low | High | Low | High | Low |
| YEnd × Team | -0.0790$^{**}$ | -0.0498$^{***}$ | -0.0698$^{**}$ | -0.0635$^{***}$ | -0.0682$^{**}$ | -0.0600$^{***}$ |
| | (0.035) | (0.005) | (0.016) | (0.008) | (0.025) | (0.006) |
| YBeg × Team | 0.0399 | 0.0248 | 0.0312 | 0.0414$^{**}$ | 0.0311$^{*}$ | 0.0365$^{*}$ |
| | (0.107) | (0.126) | (0.174) | (0.017) | (0.092) | (0.066) |
| QEnd × Team | -0.0528$^{***}$ | -0.0089 | -0.0440$^{***}$ | -0.0267$^{***}$ | -0.0388$^{***}$ | -0.0238$^{***}$ |
| | (0.000) | (0.242) | (0.001) | (0.005) | (0.004) | (0.003) |
| QBeg × Team | 0.0491$^{**}$ | 0.0207$^{***}$ | 0.0406$^{***}$ | 0.0352$^{**}$ | 0.0432$^{***}$ | 0.0239$^{***}$ |
| | (0.010) | (0.009) | (0.005) | (0.013) | (0.007) | (0.007) |
| YEnd | 0.1758$^{**}$ | 0.1218$^{***}$ | 0.1713$^{**}$ | 0.1312$^{**}$ | 0.1758$^{**}$ | 0.1091$^{***}$ |
| | (0.048) | (0.003) | (0.011) | (0.032) | (0.024) | (0.009) |
| YBeg | -0.2273$^{***}$ | -0.1127$^{***}$ | -0.1768$^{***}$ | -0.1792$^{***}$ | -0.2164$^{***}$ | -0.1070$^{***}$ |
| | (0.003) | (0.002) | (0.005) | (0.000) | (0.001) | (0.004) |
| QEnd | 0.2013$^{***}$ | 0.0737$^{***}$ | 0.1604$^{***}$ | 0.1294$^{***}$ | 0.1825$^{***}$ | 0.0783$^{***}$ |
| | (0.000) | (0.003) | (0.000) | (0.000) | (0.000) | (0.001) |
| QBeg | -0.1476$^{***}$ | -0.0710$^{***}$ | -0.1203$^{***}$ | -0.1078$^{***}$ | -0.1432$^{***}$ | -0.0615$^{**}$ |
| | (0.008) | (0.001) | (0.004) | (0.005) | (0.003) | (0.010) |
| Team | 0.0008 | 0.0002 | 0.0007 | -0.0005 | 0.0000 | 0.0007 |
| | (0.397) | (0.831) | (0.474) | (0.656) | (0.959) | (0.463) |
| Fund Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Constant | Yes | Yes | Yes | Yes | Yes | Yes |
| Obs. | 3,590,810 | 2,896,976 | 3,722,047 | 2,765,739 | 4,114,908 | 2,372,878 |

This table reports panel regression coefficients of daily excess fund returns on managerial structure for alternative hypotheses of reduced portfolio pumping using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. In Panel A, strong (weak) fund governance is proxied by the Big (Small) fund board size and High (Low) percent of independent directors with the samples split at the median. High (Low) career concerns are proxied by below (above) the median manager fund industry experience, which is the difference between the current year and the first year of managing a fund from Morningstar Direct. In Panel B, Column 1 reflects the potential of local networks, as in Christoffersen and Sarkissian (2009), and includes city fixed effects. Column 2 reflects different policy potential among fund families and includes family fixed effects. Column 3 uses the portfolio pumping case intensity control (PP Case Intensity) to account for changes in SEC's stringency over time for this illegal trading practice. The data on market manipulation cases is from the table titled "*Enforcement Cases Initiated by the Commission*" under the program area of "*Market Manipulation*". There are 883 market manipulation cases. These cases are screened for phrases such as "portfolio pumping," "marking the close," "marked the close," "painting the tape," or "leaning for the tape". This methodology gives 32 distinct portfolio-pumping cases in the sample period. Panel C splits tests by the median of fund illiquidity, concentration, and active share. Fund illiquidity is based on Amihud (2002). Concentration is based on the fund's industry concentration index. Fund active share is from Cremers and Petajisto (2009). The regression model and all variables are defined in Eq. (1) and Table 2. Each regression includes year fixed effects. The standard errors are double-clustered by fund and year. The *p*-values are in parentheses. $^{***}$, $^{**}$, and $^{*}$ indicate significance at 1%, 5%, and 10% levels, respectively.

**Table 8**
**Alternative portfolio pumping measure of Bernhardt and Davies (2005)**

| | | | Team Size | | |
|---|---|---|---|---|---|
| | Single | Team | 2 FM | 3 FM | 4+ FM |
| YEnd_BD | 0.3187*** | -0.1019** | -0.0758** | -0.0961** | -0.1517** |
| | (0.003) | (0.014) | (0.017) | (0.029) | (0.018) |
| QEnd_BD | 0.2550*** | -0.0748*** | -0.0509*** | -0.0853*** | -0.1118*** |
| | (0.000) | (0.000) | (0.001) | (0.000) | (0.000) |
| MEnd_BD | 0.0843*** | -0.0036 | 0.0007 | -0.0054 | -0.0088 |
| | (0.000) | (0.709) | (0.928) | (0.614) | (0.554) |
| Fund controls | Yes | Yes | Yes | Yes | Yes |
| Constant | Yes | Yes | Yes | Yes | Yes |
| Obs. | | 6,595,931 | 4,397,170 | 3,512,096 | 3,685,091 |

This table reports panel regression coefficients of daily excess fund returns on the constant managerial structure using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. The regression model is based on the Bernhardt and Davies (2005) methodology. The year-end abnormal return is the turn of year difference between the beginning of year and end of previous year returns; the quarter-end abnormal return is the turn of quarter difference between the beginning of quarter and end of previous quarter returns; the quarter-end abnormal return is the turn of month difference between the beginning of month and end of previous month returns. YEnd_BD, QEnd_BD, and MEnd_BD are the year-end, quarter-end, and month-end dummies, respectively. All fund controls and coefficients are defined as in Table 2. Each regression includes year fixed effects. The standard errors are double-clustered by fund and year. The *p*-values are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

**Table 9**
**Effect of exact date of managerial structure changes on portfolio pumping activity**

Panel A: No fund controls

| | | | Team Size | | |
|---|---|---|---|---|---|
| | Single | Team | 2 FM | 3 FM | 4+ FM |
| YEnd | 0.2045*** | -0.0977*** | -0.0744*** | -0.0901*** | -0.0986*** |
| | (0.004) | (0.001) | (0.000) | (0.000) | (0.008) |
| YBeg | -0.2028*** | 0.0524** | 0.0291* | 0.0377* | 0.0807*** |
| | (0.000) | (0.012) | (0.082) | (0.070) | (0.005) |
| QEnd | 0.1650*** | -0.0447*** | -0.0272** | -0.0365** | -0.0548*** |
| | (0.000) | (0.002) | (0.023) | (0.011) | (0.006) |
| QBeg | -0.1372*** | 0.0430*** | 0.0284** | 0.0278* | 0.0471*** |
| | (0.000) | (0.002) | (0.015) | (0.062) | (0.005) |
| Obs. | | 8,471,723 | 5,850,405 | 4,655,762 | 4,881,036 |

Panel B: With fund controls

| | | | Team Size | | |
|---|---|---|---|---|---|
| | Single | Team | 2 FM | 3 FM | 4+ FM |
| YEnd | 0.1583** | -0.0762*** | -0.0688*** | -0.0806*** | -0.0882** |
| | (0.016) | (0.004) | (0.000) | (0.001) | (0.012) |
| YBeg | -0.1849*** | 0.0450** | 0.0225 | 0.0379* | 0.0663** |
| | (0.001) | (0.027) | (0.180) | (0.051) | (0.016) |
| QEnd | 0.1478*** | -0.0379*** | -0.0230** | -0.0352*** | -0.0485*** |
| | (0.000) | (0.001) | (0.029) | (0.004) | (0.003) |
| QBeg | -0.1201*** | 0.0430*** | 0.0311*** | 0.0324** | 0.0481*** |
| | (0.003) | (0.002) | (0.007) | (0.027) | (0.005) |
| Obs. | | 6,459,468 | 4,331,160 | 3,433,506 | 3,641,290 |

This table reports panel regression coefficients of daily excess fund returns on managerial structure using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. The regression model and all variables are defined in Eq. (1) and Table 2. Team is a dummy variable which equals one if the fund has two (or more) fund managers and zero otherwise at a given date within the estimation year. Panel A tests have no fund controls. Panel B tests are with fund controls, which include fund size, age, turnover, past performance, fees, as well as fund family size. Each regression includes fund controls and year fixed effects. Fund controls include fund size, age, turnover, past performance, return volatility, fees, as well as fund family size. The standard errors are double-clustered by fund and year. The *p*-values are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

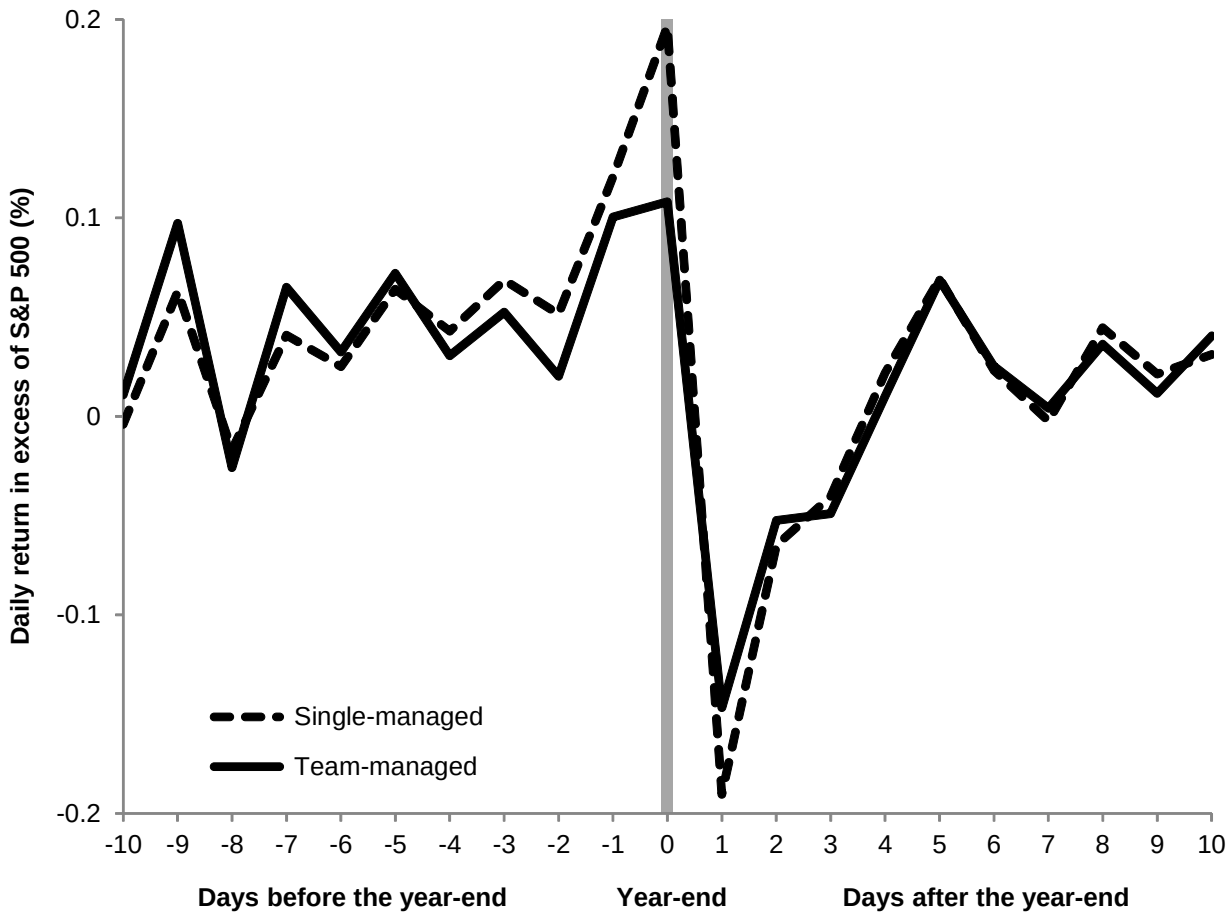



**Figure 1**
**Fund returns around the year-end for single-managed and team-managed funds**
This figure shows the daily excess returns of U.S. domestic equity mutual funds (in percent) for ten days before the last trading day of the year (day 0) and ten days in the beginning of the year for single-managed funds (dashed curve) and team-managed funds (full curve). The sample covers the period between January 1, 1992 and December 31, 2015.

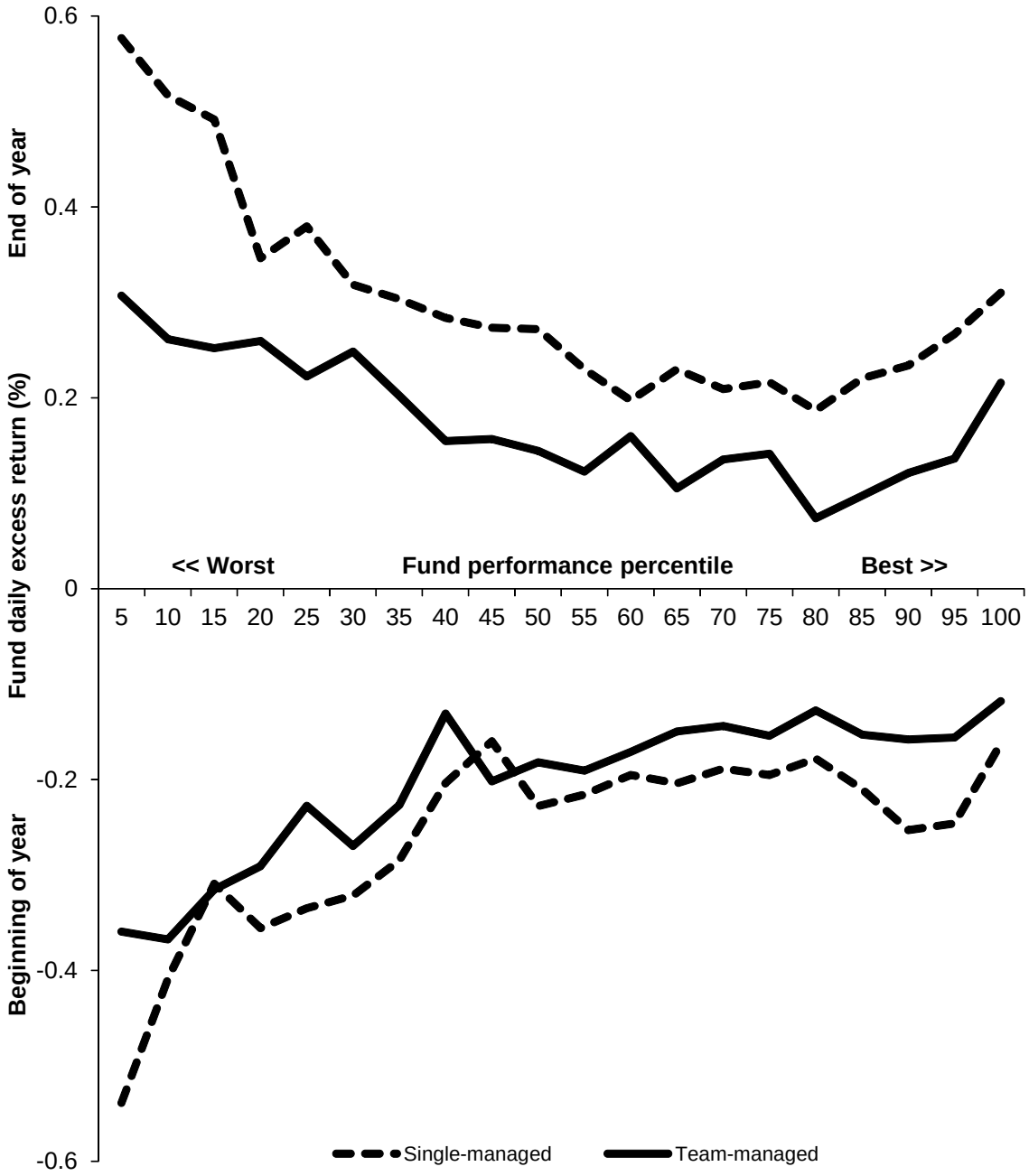
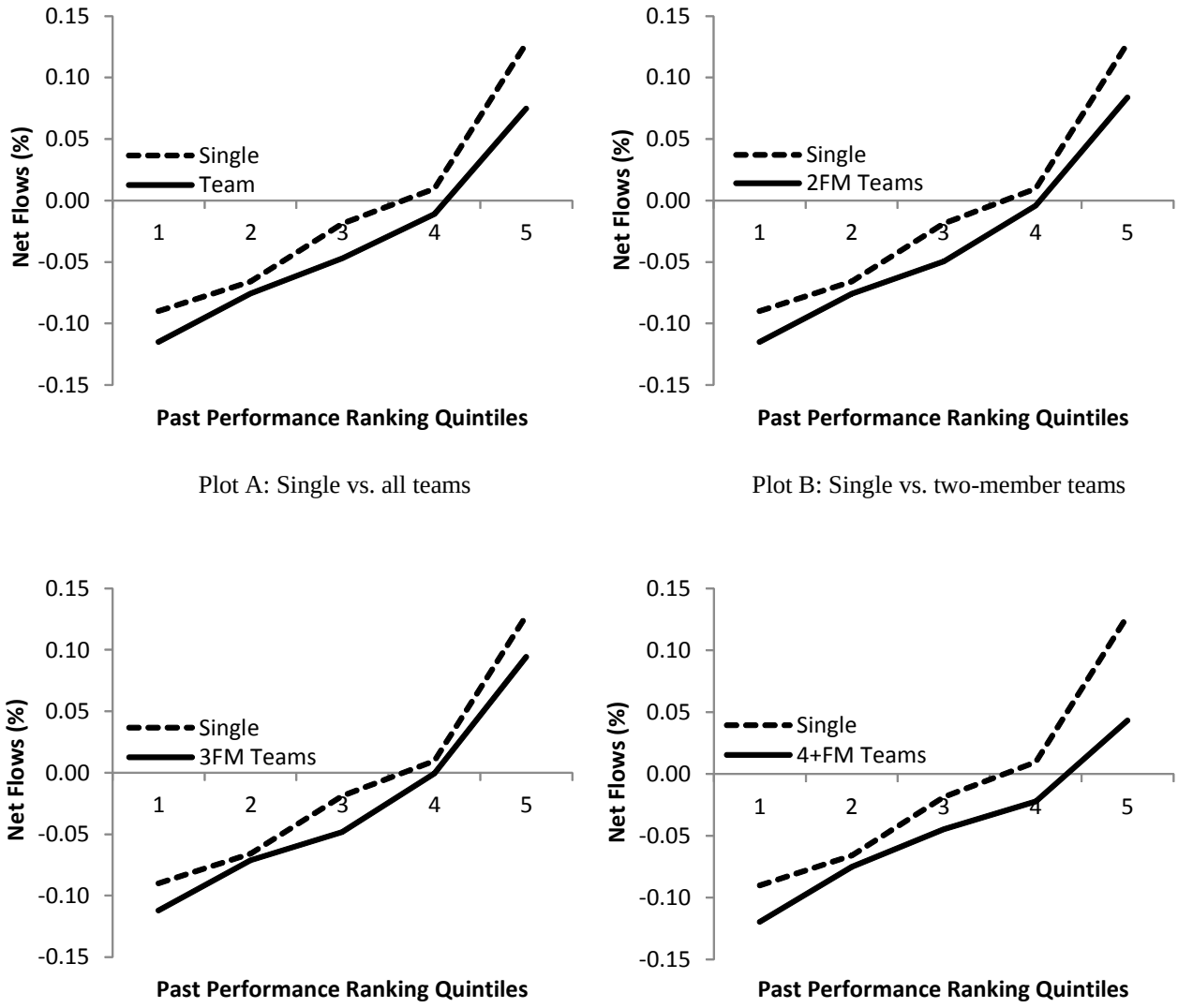



**Figure 2**

**Fund returns around the year-end for different managerial structures and performance**

This figure shows the relation between the daily excess returns of U.S. domestic equity mutual funds (in percent) on the last trading day of the year (upper plot) as well as the first trading day of the year (lower plot) and fund performance across single-managed funds (dashed curve) and team-managed funds (full curve). Fund performance is measures from the first trading day of the year to the second-to-last day of the same year and is split into 20 performance bins by 5% each. The sample covers the period between January 1, 1992 and December 31, 2015.




Plot A: Single vs. all teams

Plot B: Single vs. two-member teams

Plot C: Single vs. three-member teams

Plot D: Single vs. four-plus-member teams

**Figure 3**
**Flow-performance relation of single-managed and team-managed funds**
This figure depicts relation between the net median flows (in percent) and the lagged performance based on raw returns of single-managed and team-managed U.S. domestic equity funds. Plot A shows this relation for single-managed and all team-managed funds; Plot B – for single-managed and two-member team funds; Plot C – for single-managed and three-member team funds, and Plot D – for single-managed and four-plus-member team funds. The lagged fund performance is sorted into quintiles (1 being the worst and 5 being the best). The sample covers the period between January 1, 1992 and December 31, 2015.

# Portfolio Pumping and Managerial Structure

## INTERNET APPENDIX

## (Not for publication)

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In this Appendix, we show that the reduction in portfolio pumping activity among team-managed funds documented earlier is present across all fund investment categories and occurs irrespective of fund size, turnover, flows, and return volatility. Table A.1 presents the evidence of portfolio pumping across three investment objectives (Growth and Income funds are represented with Equity Income funds due to a small size of the later sample). Not surprisingly, the largest extent of pumping occurs among aggressive growth funds, followed by growth funds. This pattern is particularly profound at quarter-ends. Aggressive growth funds are on average the smallest across all fund investment categories. Moreover, aggressive growth funds generally tend to hold smaller and illiquid stocks, which are more susceptible to price manipulations. Therefore, price pressures on stocks that these funds hold will be higher than on stocks holdings in other fund categories. For example, the daily excess returns at the quarter-end and quarter beginning for single-managed funds stand at 26bps and -21bps, respectively. The magnitude of quarter-year (quarter-beginning) returns among team-managed aggressive growth funds is less positive (negative) than that of single-managed ones by 9bps (10bps). Similarly, to the overall picture in Table 2, we again observe that the dampening effect of team management on pumping activity increases with an increase of team size. For example, in the quarterly reporting case, the strength of portfolio pumping for aggressive growth funds with four of more managers is lower by at least 50% than that for similar single-managed funds. More precisely, the daily returns for funds with four and more managers on the last day and the first day of the quarter are only 13bps (0.2628 – 0.1333) and -6bps (0.2052 – 0.1471), respectively.

Table A.2 reports the estimation results of daily fund returns around the year- and quarter-ends for four fund size quartiles. Quartile 1 includes the smallest 25% of all funds, while Quartile 4 includes the largest 25%. The evidence of portfolio pumping among single-managed funds is present across all fund sizes. However, team-managed funds exhibit much less positive (negative) year-end (beginning-of-year) returns. Similar patterns are observed for returns around the quarter-ends. The year-end return dampening effect associated with team-management is

particularly pronounced among the smallest two fund quartiles. As before, the effect of team-management on the reduction of portfolio pumping increase with an increase of team size across all fund size quartiles.

Similar to Table A.2 tests, Tables A.3, A.4, and A.5 report the estimation results of daily fund returns around the year- and quarter-ends for four fund turnover, fund flows, and fund return volatility quartiles, respectively. The results in these tables show that the managerial structure impact on fund returns around the year-ends and quarter-ends is similar to that documented in all previous tables: portfolio pumping is significantly lower among team-managed funds, and it decreases with team size. Importantly, this reduction is not a characteristic of a fund's investment objective, size, turnover, flows, or return volatility.

Finally, in Table A.6 we rerun our main estimation with fund controls while directly controlling for differences in return volatilities across funds – we replace our dependent variable with volatility-adjusted standardized fund returns. These tests provide results are consistent with those in Table A.5. We again confirm that, irrespective of the fund return volatility environment, team-management is associated with the reduction in portfolio pumping.

**Table A.1. Effect of managerial structure on portfolio pumping across investment objectives**

| | | | Team Size | | |
|---|---|---|---|---|---|
| | Single | Team | 2 FM | 3 FM | 4 FM |
| Aggressive Growth Funds | | | | | |
| YEnd | 0.1080 | -0.0473 | -0.0543 | -0.0242 | -0.0521 |
| | (0.400) | (0.414) | (0.159) | (0.718) | (0.556) |
| YBeg | -0.3232*** | 0.0705 | 0.0428 | 0.0639 | 0.1340* |
| | (0.006) | (0.118) | (0.188) | (0.238) | (0.068) |
| QEnd | 0.2625*** | -0.0902*** | -0.0563*** | -0.1127*** | -0.1331*** |
| | (0.000) | (0.000) | (0.007) | (0.000) | (0.000) |
| QBeg | -0.2042*** | 0.0946*** | 0.0638*** | 0.0910** | 0.1462*** |
| | (0.009) | (0.004) | (0.007) | (0.014) | (0.005) |
| Obs. | | 1,314,980 | 873,345 | 693,362 | 730,065 |
| Growth Funds | | | | | |
| YEnd | 0.1585*** | -0.0744*** | -0.0561*** | -0.0845*** | -0.0900** |
| | (0.006) | (0.001) | (0.002) | (0.000) | (0.010) |
| YBeg | -0.1552*** | 0.0332* | 0.0168 | 0.0493** | 0.0547** |
| | (0.002) | (0.075) | (0.329) | (0.018) | (0.049) |
| QEnd | 0.1263*** | -0.0301*** | -0.0180* | -0.0369*** | -0.0496*** |
| | (0.000) | (0.003) | (0.060) | (0.001) | (0.002) |
| QBeg | -0.1165*** | 0.0333*** | 0.0278** | 0.0336** | 0.0445*** |
| | (0.002) | (0.003) | (0.011) | (0.026) | (0.004) |
| Obs. | | 4,047,943 | 2,687,443 | 2,173,841 | 2,269,659 |
| Growth and Income Funds (with Equity Income) | | | | | |
| YEnd | 0.1477*** | -0.0483** | -0.0403* | -0.0515** | -0.0599* |
| | (0.000) | (0.033) | (0.073) | (0.034) | (0.054) |
| YBeg | -0.0838** | 0.0093 | 0.0058 | -0.0116 | 0.0414* |
| | (0.013) | (0.607) | (0.794) | (0.336) | (0.062) |
| QEnd | 0.0753*** | 0.0005 | 0.0007 | 0.0039 | -0.0040 |
| | (0.000) | (0.956) | (0.940) | (0.773) | (0.746) |
| QBeg | -0.0338 | 0.0138* | 0.0083 | 0.0187* | 0.0219* |
| | (0.104) | (0.096) | (0.337) | (0.080) | (0.086) |
| Obs. | | 1,081,298 | 717,854 | 546,476 | 586,459 |

This table reports panel regression coefficients of daily excess fund returns on managerial structure across three investment objectives using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. The investment objectives are: Aggressive Growth, Growth, and Growth & Income, which includes Equity Income funds. The regression model and all variables are defined in Eq. (1) and Table 2. The coefficients reported in the column 2 (under Single) are the excess daily returns of funds managed by single manager. The coefficients reported in the column 3-6 (under Team and Team Size) are the interaction terms of Team and YEnd ($b_1$), YBeg ($b_2$), QEnd, ($b_3$) and QBeg ($b_4$) which reflect the difference in excess daily returns of single- and team-managed funds for the given period. Each regression includes fund controls and year fixed effects. Fund controls include fund size, age, turnover, past performance, return volatility, fees, as well as fund family size. The standard errors are double-clustered by fund and year. The *p*-values are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

**Table A.2**
**Effect of fund size on portfolio pumping and managerial structure relation**

| | | | Team Size | | |
|---|---|---|---|---|---|
| Fund Size | Single | Team | 2 FM | 3 FM | 4+ FM |
| Quartile 1 (Smallest) | | | | | |
| YEnd | 0.1611** | -0.0903*** | -0.0859*** | -0.0933*** | -0.1033** |
| | (0.012) | (0.002) | (0.000) | (0.008) | (0.042) |
| YBeg | -0.1512*** | 0.0157 | 0.0169 | 0.0217 | 0.0309 |
| | (0.007) | (0.515) | (0.503) | (0.483) | (0.387) |
| QEnd | 0.1380*** | -0.0348** | -0.0306** | -0.0240 | -0.0618** |
| | (0.000) | (0.018) | (0.027) | (0.198) | (0.018) |
| QBeg | -0.1172*** | 0.0481*** | 0.0393** | 0.0444*** | 0.0708*** |
| | (0.004) | (0.003) | (0.016) | (0.010) | (0.009) |
| Quartile 2 | | | | | |
| YEnd | 0.1538** | -0.0822*** | -0.0651*** | -0.0921*** | -0.0937* |
| | (0.013) | (0.008) | (0.005) | (0.004) | (0.084) |
| YBeg | -0.1800*** | 0.0335 | 0.0035 | 0.0472* | 0.0881** |
| | (0.004) | (0.231) | (0.900) | (0.078) | (0.034) |
| QEnd | 0.1553*** | -0.0497*** | -0.0265** | -0.0637*** | -0.0848*** |
| | (0.000) | (0.001) | (0.028) | (0.000) | (0.001) |
| QBeg | -0.0994** | 0.0239 | 0.0055 | 0.0289* | 0.0507** |
| | (0.014) | (0.115) | (0.712) | (0.096) | (0.028) |
| Quartile 3 | | | | | |
| YEnd | 0.1378* | -0.0490 | -0.0409 | -0.0525 | -0.0559 |
| | (0.061) | (0.189) | (0.204) | (0.227) | (0.286) |
| YBeg | -0.2169*** | 0.0671*** | 0.0568** | 0.0673** | 0.0889*** |
| | (0.000) | (0.003) | (0.015) | (0.032) | (0.008) |
| QEnd | 0.1621*** | -0.0454*** | -0.0284* | -0.0584*** | -0.0695*** |
| | (0.000) | (0.000) | (0.058) | (0.000) | (0.000) |
| QBeg | -0.1369*** | 0.0619*** | 0.0492** | 0.0707*** | 0.0803** |
| | (0.003) | (0.009) | (0.024) | (0.010) | (0.013) |
| Quartile 4 (Largest) | | | | | |
| YEnd | 0.1550*** | -0.0560** | -0.0364 | -0.0517** | -0.0806** |
| | (0.009) | (0.025) | (0.105) | (0.032) | (0.014) |
| YBeg | -0.1528*** | 0.0228 | 0.0005 | 0.0225 | 0.0558** |
| | (0.004) | (0.270) | (0.980) | (0.369) | (0.038) |
| QEnd | 0.1290*** | -0.0222* | -0.0120 | -0.0326** | -0.0289* |
| | (0.000) | (0.051) | (0.287) | (0.023) | (0.056) |
| QBeg | -0.1054*** | 0.0254** | 0.0245** | 0.0167 | 0.0350*** |
| | (0.002) | (0.011) | (0.023) | (0.325) | (0.007) |

This table reports panel regression coefficients of daily excess fund returns on managerial structure across different fund size quartiles using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. The regression model is as in Table 2, but it is rerun separately for each fund size quartile. All variables are defined and reported as in Table 2. Each regression includes fund controls and year fixed effects. Fund controls include fund size, age, turnover, past performance, return volatility, fees, as well as fund family size. The standard errors are double-clustered by fund and year. The *p*-values are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

**Table A.3**
**Effect of fund turnover on portfolio pumping and managerial structure relation**

| | | | Team Size | | |
|---|---|---|---|---|---|
| Fund Turnover | Single | Team | 2 FM | 3 FM | 4+ FM |
| Quartile 1 (Smallest) | | | | | |
| YEnd | 0.1386** | -0.0520* | -0.0277 | -0.0510* | -0.0838** |
| | (0.018) | (0.052) | (0.275) | (0.077) | (0.021) |
| YBeg | -0.1500*** | 0.0209 | -0.0021 | 0.0189 | 0.0533* |
| | (0.001) | (0.286) | (0.905) | (0.511) | (0.093) |
| QEnd | 0.1233*** | -0.0289** | -0.0160 | -0.0323* | -0.0486*** |
| | (0.000) | (0.013) | (0.187) | (0.052) | (0.001) |
| QBeg | -0.0748** | 0.0143 | 0.0114 | 0.0088 | 0.0239 |
| | (0.025) | (0.283) | (0.371) | (0.642) | (0.157) |
| Quartile 2 | | | | | |
| YEnd | 0.1481** | -0.0543** | -0.0431* | -0.0622*** | -0.0647 |
| | (0.011) | (0.035) | (0.059) | (0.007) | (0.116) |
| YBeg | (-0.163) | 0.0264 | 0.0058 | 0.0317 | 0.0638** |
| | (0.0019) | (0.185) | (0.766) | (0.187) | (0.030) |
| QEnd | 0.1370*** | -0.0340*** | -0.0256** | -0.0347** | -0.0493*** |
| | (0.000) | (0.010) | (0.044) | (0.021) | (0.008) |
| QBeg | -0.1075*** | 0.0386** | 0.0190 | 0.0513*** | 0.0589*** |
| | (0.003) | (0.023) | (0.269) | (0.007) | (0.003) |
| Quartile 3 | | | | | |
| YEnd | 0.1622** | -0.0757** | -0.0618*** | -0.0859*** | -0.0861 |
| | (0.014) | (0.013) | (0.005) | (0.008) | (0.111) |
| YBeg | -0.1778*** | 0.0330 | 0.0208 | 0.0488** | 0.0536 |
| | (0.002) | (0.156) | (0.368) | (0.046) | (0.126) |
| QEnd | 0.1516*** | -0.0396*** | -0.0232* | -0.0601*** | -0.0549** |
| | (0.000) | (0.002) | (0.053) | (0.000) | (0.014) |
| QBeg | -0.1282*** | 0.0450*** | 0.0372*** | 0.0441** | 0.0643** |
| | (0.002) | (0.002) | (0.002) | (0.020) | (0.014) |
| Quartile 4 (Largest) | | | | | |
| YEnd | 0.1589** | -0.0901** | -0.0894*** | -0.0822** | -0.0951* |
| | (0.041) | (0.011) | (0.003) | (0.040) | (0.059) |
| YBeg | -0.2129*** | 0.0620* | 0.0518 | 0.0607 | 0.1026** |
| | (0.007) | (0.077) | (0.117) | (0.141) | (0.031) |
| QEnd | 0.1715*** | -0.0471*** | -0.0283 | -0.0540*** | -0.0838*** |
| | (0.000) | (0.009) | (0.111) | (0.006) | (0.001) |
| QBeg | -0.1507*** | 0.0615*** | 0.0523*** | 0.0541** | 0.0829*** |
| | (0.002) | (0.003) | (0.004) | (0.033) | (0.006) |

This table reports panel regression coefficients of daily excess fund returns on managerial structure across different fund turnover quartiles using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. The regression is as in Table 2 but rerun separately for each fund turnover quartile. All variables are defined and reported as in Table 2. Each regression includes fund controls and year fixed effects. Fund controls include fund size, age, turnover, past performance, return volatility, fees, as well as fund family size. The standard errors are double-clustered by fund and year. The *p*-values are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

**Table A.4**
**Effect of fund flows on portfolio pumping and managerial structure relation**

| | | | Team Size | | |
|---|---|---|---|---|---|
| Fund Flows | Single | Team | 2 FM | 3 FM | 4+ FM |
| Quartile 1 (Smallest) | | | | | |
| YEnd | 0.1589** | -0.0735** | -0.0553** | -0.1018*** | -0.0807 |
| | (0.011) | (0.013) | (0.016) | (0.002) | (0.102) |
| YBeg | -0.1562** | 0.0271 | 0.0011 | 0.0500* | 0.0662* |
| | (0.012) | (0.268) | (0.963) | (0.054) | (0.085) |
| QEnd | 0.1251*** | -0.0273** | -0.0010 | -0.0612*** | -0.0481** |
| | (0.001) | (0.017) | (0.924) | (0.000) | (0.014) |
| QBeg | -0.1182*** | 0.0508*** | 0.0407*** | 0.0520*** | 0.0665*** |
| | (0.002) | (0.000) | (0.005) | (0.002) | (0.003) |
| Quartile 2 | | | | | |
| YEnd | 0.1450** | -0.0530* | -0.0453** | -0.0281 | -0.0780* |
| | (0.019) | (0.067) | (0.043) | (0.391) | (0.088) |
| YBeg | -0.1732*** | 0.0495** | 0.0379* | 0.0543** | 0.0759*** |
| | (0.001) | (0.015) | (0.073) | (0.035) | (0.009) |
| QEnd | 0.1287*** | -0.0377** | -0.0226 | -0.0456** | -0.0633*** |
| | (0.000) | (0.016) | (0.122) | (0.010) | (0.007) |
| QBeg | -0.1019*** | 0.0351** | 0.0248* | 0.0398* | 0.0497** |
| | (0.007) | (0.022) | (0.054) | (0.087) | (0.020) |
| Quartile 3 | | | | | |
| YEnd | 0.1197* | -0.0282 | -0.0118 | -0.0237 | -0.0488 |
| | (0.053) | (0.255) | (0.586) | (0.239) | (0.228) |
| YBeg | -0.1760*** | 0.0391* | 0.0261 | 0.0230 | 0.0763** |
| | (0.003) | (0.089) | (0.234) | (0.266) | (0.033) |
| QEnd | 0.1425*** | -0.0330*** | -0.0304*** | -0.0321*** | -0.0437*** |
| | (0.000) | (0.001) | (0.003) | (0.006) | (0.005) |
| QBeg | -0.1132*** | 0.0332** | 0.0250 | 0.0310 | 0.0517*** |
| | (0.006) | (0.046) | (0.171) | (0.117) | (0.004) |
| Quartile 4 (Largest) | | | | | |
| YEnd | 0.1281* | -0.0790*** | -0.0768*** | -0.0815** | -0.0780** |
| | (0.066) | (0.002) | (0.000) | (0.024) | (0.030) |
| YBeg | -0.1807*** | 0.0181 | 0.0024 | 0.0268 | 0.0441 |
| | (0.006) | (0.414) | (0.906) | (0.354) | (0.144) |
| QEnd | 0.1704*** | -0.0428*** | -0.0304*** | -0.0393** | -0.0696*** |
| | (0.000) | (0.000) | (0.003) | (0.021) | (0.000) |
| QBeg | -0.1322*** | 0.0463*** | 0.0345** | 0.0460** | 0.0696*** |
| | (0.006) | (0.005) | (0.015) | (0.030) | (0.005) |

This table reports panel regression coefficients of daily excess fund returns on managerial structure across different fund flows quartiles using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. The regression is as in Table 2 but rerun separately for each fund flows quartile. All variables are defined and reported as in Table 2. Each regression includes fund controls and year fixed effects. Fund controls include fund size, age, turnover, past performance, return volatility, fees, as well as fund family size. The standard errors are double-clustered by fund and year. The *p*-values are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

**Table A.5**
**Effect of fund volatility on portfolio pumping and managerial structure relation**

| | | | Team Size | | |
|---|---|---|---|---|---|
| Fund Volatility | Single | Team | 2 FM | 3 FM | 4+ FM |
| Quartile 1 (Smallest) | | | | | |
| YEnd | 0.1615** | -0.0564** | -0.0498** | -0.0208 | -0.1032*** |
| | (0.014) | (0.024) | (0.024) | (0.558) | (0.010) |
| YBeg | -0.1715** | 0.0298 | 0.0219 | 0.0248 | 0.0584* |
| | (0.024) | (0.196) | (0.408) | (0.415) | (0.074) |
| QEnd | 0.1294*** | -0.0444*** | -0.0342*** | -0.0458** | -0.0691*** |
| | (0.006) | (0.001) | (0.010) | (0.021) | (0.001) |
| QBeg | -0.0921** | 0.0113 | 0.0011 | 0.0088 | 0.0276 |
| | (0.019) | (0.406) | (0.930) | (0.662) | (0.189) |
| Quartile 2 | | | | | |
| YEnd | 0.1559** | -0.0553** | -0.0312 | -0.0787*** | -0.0657* |
| | (0.024) | (0.029) | (0.222) | (0.002) | (0.086) |
| YBeg | -0.1750*** | 0.0345** | -0.0007 | 0.0228 | 0.1037*** |
| | (0.003) | (0.033) | (0.973) | (0.294) | (0.000) |
| QEnd | 0.1368*** | -0.0300* | -0.0235 | -0.0327* | -0.0408** |
| | (0.000) | (0.090) | (0.288) | (0.083) | (0.049) |
| QBeg | -0.1082*** | 0.0158* | 0.0041 | 0.0063 | 0.0409*** |
| | (0.001) | (0.090) | (0.702) | (0.728) | (0.002) |
| Quartile 3 | | | | | |
| YEnd | 0.1765** | -0.0766** | -0.0591** | -0.0915** | -0.0857 |
| | (0.020) | (0.038) | (0.010) | (0.028) | (0.239) |
| YBeg | -0.2330*** | 0.0253 | 0.0209 | 0.0285 | 0.0555 |
| | (0.002) | (0.432) | (0.558) | (0.392) | (0.184) |
| QEnd | 0.1686*** | -0.0310 | -0.0075 | -0.0353 | -0.0770** |
| | (0.000) | (0.148) | (0.643) | (0.214) | (0.025) |
| QBeg | -0.1582*** | 0.0259 | 0.0283 | 0.0295 | 0.0241 |
| | (0.004) | (0.238) | (0.215) | (0.277) | (0.370) |
| Quartile 4 (Largest) | | | | | |
| YEnd | 0.1517 | -0.1036** | -0.0912*** | -0.1167** | -0.1118 |
| | (0.187) | (0.034) | (0.007) | (0.015) | (0.239) |
| YBeg | -0.2511** | 0.0442 | 0.0318 | 0.0451 | 0.0834 |
| | (0.044) | (0.270) | (0.422) | (0.294) | (0.193) |
| QEnd | 0.2309*** | -0.0485* | -0.0173 | -0.0637** | -0.1025** |
| | (0.000) | (0.066) | (0.449) | (0.020) | (0.030) |
| QBeg | -0.2289*** | 0.0419* | 0.0313 | 0.0166 | 0.0805* |
| | (0.004) | (0.096) | (0.167) | (0.566) | (0.068) |

This table reports panel regression coefficients of daily excess fund returns on managerial structure across different fund volatility quartiles using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. The regression is as in Table 2 but rerun separately for each fund volatility quartile. All variables are defined and reported as in Table 2. Each regression includes fund controls and year fixed effects. Fund controls include fund size, age, turnover, past performance, return volatility, fees, as well as fund family size. The standard errors are double-clustered by fund and year. The *p*-values are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

**Table A.6**
**Effect of managerial structure on portfolio pumping for fund returns standardized by volatility**

| | | | Team Size | | |
|---|---|---|---|---|---|
| | Single | Team | 2 FM | 3 FM | 4+ FM |
| YEnd | 0.3329** | -0.1502*** | -0.1203*** | -0.1529** | -0.1893** |
| | (0.013) | (0.009) | (0.009) | (0.012) | (0.028) |
| YBeg | -0.3755*** | 0.0628* | 0.0306 | 0.0604 | 0.1383** |
| | (0.001) | (0.098) | (0.372) | (0.134) | (0.018) |
| QEnd | 0.3287*** | -0.0591*** | -0.0377** | -0.0822*** | -0.0828** |
| | (0.000) | (0.010) | (0.047) | (0.001) | (0.029) |
| QBeg | -0.1914** | 0.0688*** | 0.0525** | 0.0678** | 0.0987*** |
| | (0.015) | (0.006) | (0.012) | (0.032) | (0.005) |
| Obs. | | 6,684,465 | 4,460,135 | 3,563,841 | 3,735,311 |

This table reports panel regression coefficients of standardized daily excess fund returns on managerial structure using U.S. domestic equity mutual fund data from January 2, 1992 to December 31, 2015. The regression model follows Eq. (1). The dependent variable is the daily fund return (net of expenses) in excess of daily S&P500 index return divided by the standard deviation of daily fund returns over the past 12 months. Team is a dummy variable which equals one if the fund has two (or more) fund managers and zero otherwise at the beginning of calendar year; YEnd – the last trading day of year dummy; YBeg – the first trading day of the year dummy; QEnd – the last trading day of the quarter, that is, March, June or September dummy; QBeg – the first trading day of the quarter, that is, April, July or October dummy; MEnd – the last trading day of February, April, May, July, August, October, or November dummy; and MBeg – the first trading day of February, March, May, June, August, September, November, or December dummy. The coefficients reported in column 2 (under Single) are the standardized daily excess returns of funds managed by single manager. The coefficients reported in columns 3-6 (under Team and Team Size) are the interaction terms of Team and YEnd ($b_1$), YBeg ($b_2$), QEnd, ($b_3$) and QBeg ($b_4$) which reflect the difference in standardized daily excess returns of single- and team-managed funds for the given period. Each regression includes fund controls and year fixed effects. Fund controls include fund size, age, turnover, past performance, return volatility, fees, as well as fund family size. The standard errors are double-clustered by fund and year. The *p*-values are in parentheses. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.