Institutional Trading Around M&A Announcements*

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Abstract

Takeover targets often experience substantial share price appreciations during merger and acquisition (M&A) announcements. We analyze mutual fund and hedge fund holdings around takeover announcements to assess whether these investors benefit from these announcements. Whereas mutual funds generally reduce their exposures to takeover candidates before M&A announcements, hedge funds tend to increase their holdings of takeover targets in the quarters prior to the announcements. These results suggest that mutual funds in the aggregate forgo profitable opportunities by prematurely liquidating their holdings of subsequent takeover targets. Conversely, hedge funds appear to accumulate equity in target firms prior to M&A announcements and therefore reap large profits during these transactions.

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1 Introduction

Announcements of Mergers and Acquisitions (M&A) generate substantial appreciation of the targets' equity. The stock prices of target companies increase on average by more than 20% during the M&A announcements, as illustrated in Figure 1. In this paper, we analyze the holdings of mutual funds and hedge funds around takeover announcements to identify the institutions that benefit from owning equity in the takeover targets around these announcements.

Investors can generate abnormal returns in financial markets either by having access to private information that is not yet incorporated into asset prices or by having superior ability to process publicly available information. Analyzing the patterns in holdings changes around merger announcements helps us to better understand the strategies institutional investors use to create value in their portfolios. While a substantial literature documents that the performance of mutual funds and other institutional investors is related to several fund characteristics,[1] there is a paucity of research on the specific investment strategies that institutional investors use to generate abnormal performance. Our paper sheds light on this question by analyzing whether mutual funds and hedge funds benefit from modifying their holdings on impending takeover targets.

Different types of institutional investors might rely on different methods to create value for their shareholders, because they exhibit important differences in their compensations, regulatory restrictions, and trading strategies. For example, whereas mutual funds typically charge asset-based fees that are not very sensitive to prior performance, hedge funds also frequently charge performance-based fees. Whereas mutual funds face significant regulatory restrictions and disclosure requirements, hedge funds are less regulated and offer limited transparency. Moreover, whereas mutual funds typically follow more straight-forward long-

[1] See for example, Carhart (1997), Wermers (2000), Chen, Jagadeesh, and Wermers (2000), Kacperczyk, Sialm, and Zheng (2005, 2008), Massa and Rehman (2008), Bodnaruk, Massa, and Simonov (2009), Cremers and Petajisto (2009), Amihud and Goyenko (2013), Cremers, Ferreira, Matos, and Starks (2015), Berk and Van Binsbergen (2014), Jiang and Zheng (2015), and Pastor, Stambaugh, and Taylor (2015).

only investment strategies, hedge funds often take advantage of more complex investment strategies that use derivatives, short-selling, and leverage.[2] These differences might create different incentives for different types of institutional investors to obtain private information and to process complex public information. For instance, hedge funds might have superior access to information about potential takeover candidates or they might have superior ability to predict which companies might become takeover candidates based on public information than mutual funds.

To study the holdings of institutional investors around merger announcements, we analyze a sample of 8,666 completed and withdrawn M&A transactions announced from 1990 through 2015. Our main result shows that mutual funds reduce their exposure to takeover candidates in the quarter prior to the merger announcement. Specifically, we find that, on average, mutual fund ownership in takeover targets decreases from 5.53% to 5.35% as a fraction of the target's shares outstanding during the calendar quarter preceding the public merger announcement. Our evidence indicates that many mutual funds forgo profitable investment opportunities by partially (or fully) liquidating their positions in impending takeover candidates.

In contrast to mutual funds, we find that hedge funds substantially increase their holdings in takeover candidates in the quarters prior to the merger announcement. On average, the aggregate hedge fund ownership increases from 3.44% to 3.66% during the quarter prior to the merger announcement. Our results indicate that trading strategies around merger announcements differ substantially between mutual funds and hedge funds.

We shed light on the mechanisms behind target ownership changes by mutual funds

[2]See for example, Brown and Goetzmann (1997), Fung and Hsieh (1997, 2001), Ackermann, McEnally, and Ravenscraft (1999), Liang (2000), Goetzmann, Ingersoll, and Ross (2003), Agarwal and Naik (2004), Brunnermeier and Nagel (2004), Jagannathan, Malakhov, and Novikov (2010), Kosowski, Naik, and Teo (2007), Brown, Goetzmann, Liang, and Schwarz (2008), Griffin and Xu (2009), Eling and Faust (2010), Jagannathan, Malakhov, and Novikov (2010), Ivashina and Sun (2011), Massoud, Nandy, Saunders, and Song (2011), Titman and Tiu (2011), Aragon and Martin (2012), Sun, Wang, and Zheng (2012), Agarwal, Jiang, Tang, and Yang (2013), Maslennikov and Hund (2015), Swem (2015), Gao and Huang (2016), Gargano, Rossi, and Wermers (2016), Kumar, Mullally, Ray, Tang (2017), and Qian and Zhong (2017).

and hedge funds. We begin by identifying fund management companies that advise bidders and takeover targets. These management companies might obtain early access to the information about a forthcoming takeover announcement. We find that the youngest funds in such fund families significantly increase their ownership in takeover targets prior to M&A announcements. This result is consistent with the cross-subsidization hypothesis of Gaspar, Massa, and Matos (2006), who show that mutual fund families have an incentive to favor their high-value funds (e.g., high-fee, high-performance, and young funds).

We also analyze whether there are important cross-sectional differences among institutional investors who trade the targets' equity prior to merger announcements. We use four different proxies for active management: the Active Share of Cremers and Petajisto (2009), the Tracking Error, the R^2 of Amihud and Goyenko (2013), and the absolute value of the Return Gap of Kacperczyk, Sialm, and Zheng (2008). Our findings indicate that closet-indexers tend to forgo the largest benefits of takeover announcements by selling out their shares in takeover targets prematurely. We find that mutual funds that are more actively managed tend to decrease their ownership of future takeover targets to a lesser extent.

We also study whether the hedge fund results are driven by the activist hedge funds identified by Brav, Jiang, and Kim (2015). We identify acquisition targets held by hedge fund activists who file a Schedule 13D during the 365-day period before the M&A announcement date. Of 8,300 M&A targets, 79 are both activism and acquisition targets. Our results show that hedge fund activists significantly increase their stakes in these 79 target companies prior to M&A deal announcements. In contrast, ownership changes by non-activist hedge funds (i.e., those without a Schedule 13D filing) are insignificant. These findings suggest a possible channel that generates gains for some hedge funds.

Our study contributes to the active debate on whether institutional investors profit from takeover announcements. Jegadeesh and Tang (2010) investigate whether institutional investors obtain inside information of takeover announcements. They find that trades of funds as a group are not profitable. However, they find that institutional investors whose

main broker is also a target advisor are net buyers of target shares before announcements and their pre-announcement trades are significantly profitable. In contrast, Griffin, Shu, and Topaloglu (2012) are unable to find much evidence to support that investment bank clients take advantage of connections through takeover advising using broker-level trading data. They conclude that institutional investors are reluctant to use insider information in traceable manners. Whereas those papers are primarily interested in the short-term trading immediately prior to the merger announcement, we analyze trades over longer horizons. Furthermore, our data includes a broader set of mutual fund and hedge funds investors than these two prior papers albeit at a lower frequency. In a related study, Dai, Massoud, Nandy, and Saunders (2014) analyze the trading of different types of hedge funds around merger announcements. They find that, on average, short-term hedge funds purchase 3.2% of a target's shares in the quarter immediately prior to the public announcement of an M&A deal, whereas long term hedge funds, on average sell 1.1% of the target's shares during the same quarter. In contrast with the work of Dai et al., our paper focuses on the overall trades of institutional investors and contrasts mutual funds and hedge funds.

This study also contributes to the literature that investigates the specific methods that institutional investors use to create value for their investors. Cohen, Frazzini, and Malloy (2008) find that fund managers exhibit superior performance when they trade shares of firms they are connected to through their educational networks. Baker, Litov, Wachter, and Wurgler (2010) find that a significant amount of outperformance of mutual funds takes place around corporate earnings announcements. Swem (2015) shows that hedge fund trades predict the direction of subsequent analyst ratings change reports, while mutual fund trades do not. Similarly, trades around merger announcements can also provide an explanation of how institutional investors create value for their shareholders. Our paper shows that some investment managers create value by increasing their holdings in prospective takeover targets.

The paper proceeds as follows. We describe the sample construction and the summary

statistics in Section 2. Section 3 includes the empirical results on trading by mutual funds and hedge funds. Section 4 sheds light on the mechanisms behind ownership changes by institutional investors, and Section 5 provides cross-sectional evidence. The last section concludes.

2 Data and Sample Construction

The data for this study come from several sources. First, we obtain data on M&A deals for the period of 1990 through 2015. The initial sample consists of 34,144 transactions with the following deal characteristics: mergers, acquisitions, and acquisitions of a majority interest. We eliminate small deals with a transaction value below $1 million. This yields 29,190 transactions. In addition, we require targets to be publicly traded firms. After imposing these criteria our sample consists of 8,666 completed and withdrawn M&A transactions. Second, we obtain mutual fund monthly returns, expenses, total net assets, turnover ratio, and other fund characteristics from the Center for Research in Security Prices (CRSP) Survivor-Bias-Free Mutual Fund database. Third, the Thomson holdings database provides data on mutual fund equity holdings. To merge the Thomson holdings database with the CRSP Mutual fund database, we use MFLINKS from the Wharton Research Data Services (WRDS). To examine the evolution of hedge fund trading in target firms, we identify those within the pool of all 13F institutions reported in Thomson Financial. We use the hedge fund identifier from Maslennikov and Hund (2015).[3] Individual stock prices and returns are from the CRSP monthly stock file.

Panel A of Table 1 provides descriptive statistics for 8,666 M&A offers in our sample. These deals have a completion rate of 80.9%. About 42.2% of the transactions in our sample are paid fully in cash, and 26.6% are paid fully in stock. Deals with multiple bidders constitute 8.8% of our sample. In 49.3% of the offers, both the target and the

[3]We are grateful to Sergey Maslennikov for sharing his data on hedge fund holdings.

bidder operate in different industries. About 17.6% of the deals are tender offers and 8.7% are characterized as hostile. These summary statistics are similar to those reported in other M&A studies (e.g. Gaspar, Massa, and Matos (2005), Fich, Harford, and Tran (2015), Chen, Harford, and Li (2007)).

The benefit of owning a target's equity during the M&A announcement is substantial. Figure 1 illustrates the evolution of the average cumulative abnormal returns (CARs) around M&As during the trading day window [-250; +55] relative to the deal announcement date. We calculate cumulative abnormal returns as $CAR_{ij} = \sum_{j=1}^{t}(r_{ij} - r_{mj})$, where r_{ij} is a firm's $i's$ return and r_{mj} is the CRSP value-weighted market return at time j. To mitigate the effect of delisting on CARs after announcements, we set abnormal returns of delisted targets to zero. The three-day average cumulative abnormal return for the targets in our sample is 21%. We find a significant increase in the prices of target companies prior to the M&A announcement, as shown by Keown and Pinkerton (1981) and Schwert (1996).

We focus on actively-managed domestic equity mutual funds. We start with a sample of 3,864 funds for the period 1990-2015 in the Thomson holdings database with available fund names and with the following investment objective styles: aggressive growth, growth, and growth and income. We eliminate index funds by screening out fund names for the following words: "Index," "Indx," "Market," "S&P," "ETF," and "NYSE." This procedure produces a sample of 3,748 unique funds. Consistent with other studies (e.g. Kacperczyk, Sialm and Zheng, 2008), we remove fund observations with fewer than 11 stocks in a portfolio. As a result, we obtain 3,640 funds.

Next, we record fund returns, total net assets under management (TNA), and other fund characteristics (e.g., turnover, expense ratio) from the CRSP Survivor-Bias-Free Mutual Fund database and merge these data with the Thomson holdings database. There are a number of mutual funds with multiple share classes. Typically, fund share classes differ in fee structure and clientele (e.g., institutional or retail). Similar to the procedure used by Kacperczyk, Sialm, and Zheng (2008) and Wermers, Yao, and Zhao (2012), we combine

multiple share classes into one fund. We then calculate the TNA for each fund as the sum of all values of assets across multiple fund shares. Fund age is the maximum age of its share classes. For the remaining fund characteristics, we aggregate different share classes by taking the TNA-weighted average across all share classes of a fund.

We exclude the first 18 months of fund returns to decrease the impact of the incubation bias reported by Evans (2010). In addition, we require non-missing fund returns and non-missing total net assets under management. After applying these filters, we keep 2,128 funds. Because Elton, Gruber, and Blake (2001) suggest that the returns of funds with TNA less than \$15 million are biased upwards in the CRSP Mutual Fund database, we exclude all funds with TNAs below \$15 million as of the beginning of the month. In addition, we require non-missing fund characteristics (age, turnover, and expense ratio). Our final sample contains 1,791 unique funds.

Panel B of Table 1 provides summary statistics for our final sample of mutual funds. These are calculated from 65,854 fund×quarter observations. The average fund in our sample manages \$1.99 billion in assets, is 18 years old, has an expense ratio of 1.22%, and exhibits a turnover ratio of 80%. On average, funds achieve a raw portfolio return net of expenses of 2.24% per quarter. These summary statistics are consistent with those documented in the literature (e.g., Huang, Sialm, and Zhang (2011), Amihud and Goyenko (2013), and Jiang and Verardo (2013)).

To construct our sample of hedge funds, we obtain institutional holdings from the Thomson database over the period of 1990-2015. There are 6,569 unique institutional investors who file a 13F schedule during this time period. Using the updated identifier from Maslennikov and Hund (2015), we obtain 1,162 unique hedge funds. Based on the reported 13F holdings across 31,089 fund×quarter observations, an average hedge fund holds about 93 stocks in its portfolio. This constitutes about \$885 million in equity holdings.[4]

[4]This amount is obtained by averaging the total dollar value of hedge fund equity holdings across 31,089 fund×quarter observations.

3 Mutual Fund and Hedge Fund Trading in Takeover Targets

In this section we analyze the holdings of mutual funds and hedge funds around takeover announcements. We present both univariate and multivariate analyses.

3.1 Univariate Analysis for Overall Sample

We start by examining the aggregate mutual fund and hedge fund ownership in takeover targets around the M&A announcement. For each target, we calculate the total number of shares held by all mutual funds in our sample as a fraction of total shares outstanding in each of the four quarters prior to the M&A announcement quarter, which are denoted as $Q(t-4)$ through $Q(t-1)$.[5] Similarly, we aggregate hedge fund ownership for each to-be target and analyze the ownership by these funds as a fraction of shares outstanding. We also report the holdings of mutual funds and hedge funds at the end of the announcement quarter $Q(t)$. These results must be interpreted with caution because it is not clear whether the positions in takeover targets were acquired before or after the public announcements.

Figure 2 compares the evolution of mutual fund and hedge fund ownership in to-be targets from several quarters prior to the M&A announcement until one quarter after. The figure shows that hedge funds start building their positions in takeover targets well ahead of the merger announcement date. In contrast, mutual funds gradually reduce their positions in these firms. According to Figure 2, mutual funds are *net sellers* of takeover targets, and hedge funds, in aggregate, are *net buyers* of these potentially profitable stocks. The accumulation of target stock after merger announcements might be due to merger arbitrage strategies by hedge funds.[6]

For both mutual funds and hedge funds, we test the statistical significance of the changes

[5] We adjust holdings for stock splits by multiplying the reported number of shares by the CRSP adjustment factor.

[6] A common strategy of hedge funds is to purchase target company stocks immediately after the public announcement, as discussed by Mitchell and Pulvino (2001), Baker and Savasoglu (2002), and Hsieh and Walking (2005).

in takeover target ownership during the merger pre-announcement period. Table 2 reports the results. We find that mutual fund ownership in takeover targets significantly decreases by 18 basis points (from 5.53% to 5.35%) one quarter prior to the announcement quarter. The average change in aggregate mutual fund ownership during the previous quarters is small in magnitude. In contrast, we observe persistent significant increases in target ownership by hedge funds during the quarters preceding the M&A announcement quarter. The average change in hedge fund ownership in takeover targets from quarter $Q(t-4)$ to quarter $Q(t-1)$ is 51 basis points (from 3.15% to 3.66%).

We estimate the economic effects of declining mutual fund holdings prior to merger announcements by calculating the dollar amount of these changes in target holdings. We find the product of the change in aggregate mutual fund shares and the end-of-quarter target share price (in the quarter prior to the M&A announcement quarter), and then add up these products across all target firms in each M&A announcement quarter.

3.2 Univariate Analysis for Subsamples

We also perform univariate tests for various subsamples based on various deal characteristics of merger announcements, as reported in Table 3. We divide in Panel A our sample of M&A transactions based on the timing of their announcements during the event quarter. The timing of the announcement is informative because it helps us to better understand the timing of trades within a quarter. For example, if a merger announcement takes place at the beginning of quarter t, then the holdings at the end of quarter $t-1$ are more likely to incorporate the trades by institutions that anticipate an imminent takeover announcement. On the other hand, the holdings at the end of quarter $t-1$ are less likely to incorporate a takeover announcement that occurs at the end of quarter t. Of the 8,300 deals, 1,699 are announced within the first 20 calendar days of the quarter, 4,699 are announced in the middle of the quarter, and the remaining (1,902) deals become public within the last 20 calendar days of the announcement quarter. Our results show stronger ownership changes

by funds for the transactions announced at the beginning of the event quarter. This is an indication that trading by mutual funds and hedge funds in takeover targets is accelerating immediately prior to the takeover announcement. Thus, the trades in quarter $t-1$ prior to the announcement reported in Table 3 might understate the overall trading prior to the announcement since some of the trading likely occurs in the announcement quarter t.

In Panel B we separate the takeovers according to whether they were announced during 1990-2001 or during 2002-2015. Our subperiod analysis is motivated by two main reasons. First, mutual funds and especially hedge funds have become more important participants in financial markets since 1990. Second, Regulation Fair Disclosure (Reg-FD) passed in 2000 and it requires that all material information be shared with all investors at the same time. The sub-sample results indicate consistent results across the two sub-samples. Mutual funds reduce and hedge funds increase their holdings of takeover targets in the quarter prior to the announcement during both time periods. The magnitudes of the portfolio changes are more pronounced during the latter time period. However, this result is explained primarily by the growth of both fund types.

Additionally, we examine in Panels C and D whether funds' purchases are stronger (weaker) in targets with higher (lower) premiums and three-day CARs around the deal announcements. We sort targets based on SDC premiums and the three-day CARs around M&A announcements. We find that hedge fund buying activity is stronger for targets that experience lower CARs around announcements and lower premiums. Overall, these findings suggest that even though hedge funds may have information about upcoming merger announcements or possess a special skill in identifying takeover targets, hedge fund managers, on average, might not be able to identify the deals with the highest announcement returns. However, it is also possible that hedge fund trading increases the pre-announcement price of to-be target which, in turn, may lower the observed premium.

An interesting finding is that mutual funds substantially reduce their ownership in targets associated with tender offers (by 62 basis points) relatively to non-tender deals (by 8

basis points), as reported in Panel E. Tender offers are generally more of a surprise than non-tender offers, which may explain why we see stronger selling activity among mutual funds for this type of deal.

Overall, our results on various sample sorts suggest that mutual funds are generally uninformed about forthcoming M&A announcements, as their ownership reduction is stronger for deals announced at the beginning of the event quarter and for tender offers. For hedge funds, possible drivers of their trading prior to the public announcements could be due to private information, managerial ability to identify to-be targets, or both. While we do not take a particular stand on the mechanism behind this behavior, it appears that mutual funds, in the aggregate, "leave money on the table," and hedge funds pick it up. As noted earlier, the economic effects of these trading dynamics are substantial. Our results provide a striking contrast between mutual funds and hedge funds with respect to their trading behavior in to-be M&A targets.

3.3 Multivariate Analysis

While the univariate analysis is informative about the overall dynamic pattern of trades by mutual funds and hedge funds around takeover announcements, it does not control for target characteristics. Controlling for target characteristics is important since the sample of observations in the univariate tests is selected based on whether a company becomes a takeover target. Hedge funds might purchase stocks with specific characteristics (e.g., value stocks). These stocks might also be more likely to become takeover targets, because acquiring companies might consider the same characteristics when selecting potential takeover targets. Furthermore, hedge funds might not only increase their positions in takeover candidates, which experience a significant increase in stock prices at the announcement, they might also increase their positions in similar firms that fail to become takeover candidates and therefore might experience a decline in their stock prices since the anticipated acquisition does not materialize.

To address these concerns, we run a logit regression that predicts whether a company becomes a target using the universe of publicly traded firms and controlling for firm characteristics. These specifications explore the effect of mutual fund and hedge fund ownership (both in levels and in changes during the M&A pre-announcement period) on the probability of a takeover. In Table 4, we run regressions in which the dependent variable is one if a firm is a takeover target during the announcement quarter, $Q(t)$, and 0, otherwise. The variables of interest in these regressions include the mutual and hedge fund level ownership in firms in $Q(t-4)$, as well as the changes in ownership by these institutional investors during the quarters preceding the M&A announcement quarter. The control variables are the target firm's market capitalization, one-year stock return, and market-to-book ratio. These controls capture popular quantitative investment strategies based on size, value, and momentum. The standard errors are clustered at the firm level and the regressions include time-fixed effects and two-digit SIC fixed effects.

The results in Table 4 suggest that both mutual and hedge fund ownership in Q(t-4) are positively associated with the probability of a firm becoming a takeover target four quarters later. Consistent with our univariate results, subsequent ownership changes by mutual funds are inversely related to the takeover probability, whereas subsequent hedge fund ownership changes are positively associated with the likelihood of a company becoming a target. The changes in hedge fund ownership are statistically significant for the three quarters prior to the announcement quarter. These results indicate that the ownership changes are not just due to the anticipation of imminent takeover announcements.

4 Mechanisms

In this section, we explore possible mechanisms that might explain the trading activity of mutual funds and hedge funds around M&A announcements. Fund management companies that serve as M&A advisors to targets and acquirers may provide information about

forthcoming deal announcements to their affiliated funds. We therefore analyze trading by mutual funds whose management company serves as an M&A advisor to targets or acquirers. Also, changes in hedge fund holdings might also be related to hedge fund activism. Consequently, we also explore the trading activity in to-be targets by hedge fund activists.

4.1 Mutual Fund Affiliation with M&A Advisors

Growing evidence suggests that financial conglomerates may exploit their access to private information in various ways. Bodnaruk, Massa, and Simonov (2009) document that financial conglomerates in which affiliated investment banks advise acquirer firms take positions in target companies before M&A deal announcements. Massa and Rehman (2008) find that mutual fund managers increase their holdings in companies that borrow from their affiliated banks. These authors document that such trading is profitable, as fund managers may take advantage of informal channels through their affiliation with lending banks. Jegadeesh and Tang (2010) also study institutional trades around takeover announcements. They provide evidence that funds whose main broker is also a target advisor are net buyers of target shares before announcements and their pre-announcement trades are significantly profitable.

In our sample, some mutual funds are affiliated with financial conglomerates that also provide M&A advisory services. Out of the 1,791 funds in our sample, 1,782 have information about their affiliated management company name. The target M&A advisor name is available for 7,442 (out of 8,666) deals, and the acquirer M&A advisor name is available for about 62% of our sample offers (5,336 transactions). Some companies have multiple M&A advisors. We identify funds affiliated with M&A advisors by name matching and examine their ownership in to-be targets prior to deal announcements.[7]

Panel A of Table 5 reports the ownership of the target company by mutual funds whose management company advises M&A bidders or targets. The target ownership by funds that

[7]The fund family companies that also play an M&A advisory roles include Goldman Sachs, JP Morgan, Merrill Lynch, Wells Fargo, Oppenheimer, Salomon Brothers, and Smith Barney.

are affiliated with M&A bidder advisors declines by about 0.014% during the three quarters prior to the deal announcement quarter. This finding is consistent with those reported for all mutual funds in our sample (Tables 2 and 4). In contrast, the funds affiliated with M&A target advisors increase their ownership by about 0.012% in takeover targets in the three quarters prior to the merger announcements. It is not clear whether this increase in ownership is due to an anticipation in a future takeover or if fund companies with increasing ownership stakes are more likely to be selected as advisors by potential takeover targets. An indication that the ownership changes are not driven by short-term information about an upcoming takeover announcement is provided by the fact that the ownership does not change in the quarter immediately prior to the takeover announcement. Overall, the changes in target ownership by mutual funds, whose management company advises either bidders or targets, are not significant.

We further explore the informational channel between mutual funds and their management companies. Gaspar, Massa, and Matos (2006) show empirical evidence that fund management companies engage in strategic cross-fund subsidization within families. Those authors argue that management companies may favor some funds within their families because these favored funds are most likely to increase overall family profits.

We follow the methodology of Gaspar, Massa, and Matos (2006) to identify these categories and classify funds as of quarter $Q(t-2)$. As in Gaspar et al. (2006), we identify high value funds as the funds that either charge relatively high fees, show relatively strong performance, or are relatively young compared to other funds in same fund family. High fees funds are those in the top quartile of funds based on the total fees among other funds in their management company.[8] High performing funds are those in the top quartile of funds relative to other funds with the same investment objective style based on the fund year-to-date return. The year-to-date return is the fund return since January of the current year. The youngest funds are identified in the bottom quartile of funds based on the age

[8]The total fees measure is calculated as the expense ratio + (total load)/7.

since initiation compared to all other funds within fund family.

Panel B of Table 5 reports the evolution of ownership by high-value funds affiliated with investment companies that advise M&A targets in quarters prior to the merger announcements. Overall, we do not find a significant increase in ownership for high-value funds. Of these high-value funds, the highest-fee funds exhibit no clear directional movement toward target stakes, as they significantly increase their ownership in target firms from $Q(t-3)$ to $Q(t-2)$, but then reduce it by a similar amount. We observe no significant ownership changes by funds with the strongest performance, whether they belong to families with or without M&A advisor relationships. In contrast, our results show that ownership by the youngest funds in the family that is among a target's M&A advisors significantly increases in the quarters preceding the deal announcement quarter. Thus, we find mixed evidence on cross-subsidization effects for families affiliated with M&A advisors.

4.2 Hedge Fund Activism

A number of studies provide evidence that hedge funds managers are able to influence corporate management and act as informed monitors. Brav, Jiang, Partnoy, and Thomas (2008) find that the market positively reacts to hedge fund activism. Their results show a relatively large average abnormal return for an activism target firm of about 7% over the period beginning 20 days prior to the filing of a Schedule 13D to 20 days after. Brav et al. (2008) also document improvements in target firms' operating performance associated with hedge fund activism. Such positive outcomes can be explained by activists' intervention and the disciplinary mechanism imposed on the management of target firms. In contrast, Greenwood and Schor (2009) argue that most of the activism announcement returns are explained by activists' ability to force target firms into a takeover. Greenwood and Schor (2009) suggest that activists target certain firms because they anticipate that those companies will soon be acquired. Gantchev and Jotikasthira (2017) demonstrate that institutional sales raise a firm's probability of becoming an activist target and Boyson, Gantchev, and

Shivdasani (2017) find that activist interventions substantially increase the probability of a takeover offer. While it is not straightforward to disentangle the drivers of the market reaction to activism announcements, it is plausible that hedge fund activists influence corporate management decisions; and through this relation with a firm's management, hedge fund managers may have access to information that other market participants do not.

We explore this plausible channel between hedge fund activists and their target firms. The expanded sample from Brav, Jiang, Partnoy, and Thomas (2008) includes 4,058 activist×target observations over the period 1994-2014 for the sample of 663 unique hedge funds.[9] The number of unique hedge funds in our sample is 1,162. After matching by fund name, we find that 114 out of 663 activists appear in our sample of hedge funds. A total of 548 activism target firms are held by these 114 activists. Out of 548 *activism* targets, 79 firms are also *acquisition* targets held by activists who filed 13D during the 365-day period before the M&A announcement date.

We next examine the trading activity by activists in takeover targets prior to M&A announcements. Panel A of Table 6 reports ownership for the identified activists holding shares of all M&A target firms in our sample (they may or may not be activism targets). Consistent with our baseline results for hedge funds (see Table 2), activists increase their ownership in M&A targets prior to deal announcements.

Panel B of Table 6 includes hedge fund activist ownership in 79 activism targets that are also M&A targets held by funds who file a Schedule 13D within one year before the merger announcement date. Panel C reports the percentage ownership in these firms by Non-activist hedge funds. In the subset of the 79 firms that are both activism and M&A targets, the increasing trend in hedge fund ownership prior to deal announcements is mostly driven by activists' trading. On one hand, it could be that hedge fund activists are better

[9]We are grateful to Alon Brav, Wei Jiang, and Hyungseob Kim for sharing their data on hedge fund activism between 1994 and 2014. By law, investors are required to file Schedule 13D within 10 days after transactions that cause them to go over the 5% ownership threshold. Typically, crossing this 5% threshold is aimed at pursuing activism by hedge funds.

able to force targets into a takeover. On the other hand, it is also plausible that hedge fund activists could take advantage of their access to private information.

We also compute hedge fund ownership for transactions excluding the activist hedge funds, and all hedge fund ownership in the 79 activism and takeover targets. The results are reported in Panels D and E of Table 6. The findings in these sub-samples are consistent with the baseline tests for all hedge funds in suggesting that ownership changes in target firms. Overall, the evidence in Table 6 shows that activism is one of several possible channels for value creation by hedge funds.

5 Cross-Sectional Evidence

In this section we study whether there are systematic differences in trading across mutual funds around takeover announcements.

5.1 Fund Activeness

We explore whether trading in takeover targets is a function of managerial activeness. From the aggregate mutual fund analyses described above, we transition to the fund-by-deal setting in this section. We consider several measures of mutual fund activeness. First, we use the *Active Share* classification proposed by Cremers and Petajisto (2009). *Active Share* is computed as the share of portfolio positions that differ from the benchmark index holdings. Our second measure of activeness is $Tracking\ Error$, which is the standard deviation in error terms from regressions of excess fund return on excess index returns. Third, we follow the methodology of Amihud and Goyenko (2013) and construct a measure of stock-selectivity, $Fund\ (1 - R^2)$. R^2 comes from four-factor regressions using the previous 36 monthly return observations. Since a lower R^2 is indicative of greater selectivity, we subtract its value from 1 for easier comparability with the other activeness measures. Our fourth measure of activeness is the absolute value of the Return gap, proposed by Kacperczyk,

Sialm, and Zheng (2008). This measure is the difference between the reported fund return and the return on the portfolio that consists of previously disclosed holdings.[10]

Our dataset consists of 11,265,516 fund-by-deal observations, including funds that exist at the time of the deal announcement, but that do not hold a takeover target. We estimate regressions in which the dependent variable is the change in mutual fund ownership, constructed by subtracting a log(1+#shares held) in quarter $(t-2)$ from a log(1+#shares held) in quarter $(t-1)$, given that quarter t is the deal announcement quarter. If a fund does not own shares of a to-be target, its number of shares held is set to zero. The independent variables of interest are the active management measures described above. Other independent variables include fund, deal, and target characteristics. Unless otherwise specified, all independent variables are measured as of quarter $(t-2)$.

Table 7 reports the results. We find a strong positive relation between the change in fund ownership in takeover targets prior to M&A announcements and fund activeness. This evidence suggests that more active mutual funds either increase or do not decrease their stake in to-be targets as much as other mutual funds do. Even though the mutual fund sector, as a whole, significantly decreases their holdings in targets prior to deal announcement (as shown in Table 2), active funds appear to be either informed or skillful enough to predict takeover targets.

We further explore the possibility that the trading behavior by active funds is common regardless of a company's potential to become a takeover target. In other words, we examine if more active funds exhibit the same trading tendencies in otherwise similar non-target stocks. We run a propensity score matching procedure to generate a control sample that consists of firms that have comparable characteristics as the target companies, except that the control firms are not associated with takeovers at a given point in time.

In the propensity score matching analysis, we run a logistic regression modeling the probability of a firm being a takeover target. We use all firms in CRSP for the period 1990-

[10]Our results are qualitatively consistent when using either Return gap or its absolute value.

2015 as the universe of stocks and create a stock-by-quarter dataset. To identify takeover targets, we use the 34,144 M&A transactions reported in SDC over the period of 1990-2015. We then merge the universe of CRSP stocks with the set of SDC acquisition deals on the basis of a target's identifier and the merger announcement quarter. This procedure generates 8,797 targets. This number of targets is slightly greater than our sample of 8,666 targets because we do not apply the deal size filter for modeling the probability of a firm becoming an acquisition target. We therefore have 8,797 treated observations and 734,476 untreated firm-quarter observations for the logistic regression analysis. We estimate a logit regression where the dependent variable is 1 if a firm is a takeover target in quarter t (announcement quarter), and 0, otherwise. We model the takeover probability as a function of a stock's market capitalization, quarterly return, market-to-book ratio, leverage, and liquidity. These independent variables are measured as of quarter $(t-1)$, unless specified.

In Panel A of Table 8, we report the logit regression of the probability of becoming a takeover target. The results in column 1 of Panel A are generally consistent with those of other studies that examine the probability of becoming an acquisition target (e.g. Palepu (1986), Gaspar, Massa, and Matos (2005), Fich, Harford, and Tran (2015)). For example, we find that small and value firms are more likely to become takeover targets. Neither firm leverage nor liquidity loads significantly in our logit regression. Columns 2 and 3 report the average values of characteristics for both the treatment (i.e., targets) and control groups. The last column presents p-values associated with differences in the treatment and control sample means. None of the average characteristics of the treatment group are statistically different from those of the control group. We use the control sample of 6,182 companies generated from the propensity score matching technique for the following analyses.

We repeat the procedure related to the change in ownership by mutual funds. However, instead of using the target firms in our sample, we use the control firms from the propensity score matching approach. As noted earlier, the control group firms possess similar characteristics to those of the target firms, except that the control sample firms are not takeover

targets. Since the control group contains untreated observations, there are no M&A deal characteristics associated with these firms. Thus, we include the firm and fund controls, but no deal controls.

Looking at the results in Panel B of Table 8, across all specifications, the mutual fund activeness measures are not positively associated with the change in ownership in the control sample firms. This evidence suggests that active funds' portfolio rebalancing of takeover targets prior to deal announcements is not random. Therefore, our analyses indicate that the "targetness" of some firms influences the trading behavior by actively managed funds.

5.2 Persistence

The estimates in Table 7 indicate that portfolio changes are systematically related with the activeness of the funds. We explore whether this tendency of allocating higher (lower) portfolio weights to target firms is persistent over time. We sort all mutual funds based on the total portfolio weights of holdings in one or more M&A targets at the end of the quarter prior to the announcement quarter after eliminating funds with zero-weights in target firms. We then examine the portfolio weights allocated to future target firms in the following four quarters. That is, in $Q(t-1)$, we sort all funds in terciles based on the weight allocated to targets announced in $Q(t)$. Afterwards, we calculate the weight allocated by funds in each tercile in $Q(t)$ to firms that become targets in $Q(t+1)$. Using this method, we also compute the weights in to-be targets in $Q(t+2)$ and $Q(t+3)$.

Panel A of Table 9 reports average weights allocated to takeover targets by funds in each tercile formed in $Q(t-1)$. We compute the differences in average weights for the highest and lowest terciles, and report Newey-West-adjusted t-statistics. The results show that portfolio weights allocated to target firms announced in the following quarter are persistent over time. This evidence suggests that mutual funds dedicating higher portfolio weights to target firms announced in the next quarter tend to allocate significantly higher weights to future M&A targets.

We perform similar tests on the hedge funds' portfolio weights in to-be takeover targets. The results are reported in Panel B of Table 9. Similar to the outcomes for the mutual fund sample, we observe persistence in portfolio weights in takeover targets allocated by hedge funds.

6 Conclusion

We analyze the holdings of institutional investors around takeover announcements to identify whether some investors benefit from these transactions. We find that while mutual funds generally reduce their exposure to takeover candidates in the quarters prior to the merger announcement, hedge funds increase it. Overall, our results suggest that mutual fund managers are generally uninformed about future merger and acquisition deals. In contrast, more highly incentivized institutions, such as hedge funds, are able to gain from the large announcement effect of M&A transactions to a substantially greater extent.

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Figure 1: Cumulative Abnormal Returns around Merger Announcements

This figure illustrates the evolution of the equal-weighted average cumulative abnormal returns (CARs) around merger announcements. We calculate cumulative abnormal returns as $CAR_{ij} = \sum_{j=1}^{t}(r_{ij} - r_{mj})$, where r_{ij} is a firm's $i's$ return and r_{mj} is the CRSP value-weighted market return at time j. To mitigate the effect of delisting on CARs after announcements, we set abnormal returns of delisted targets to zero.

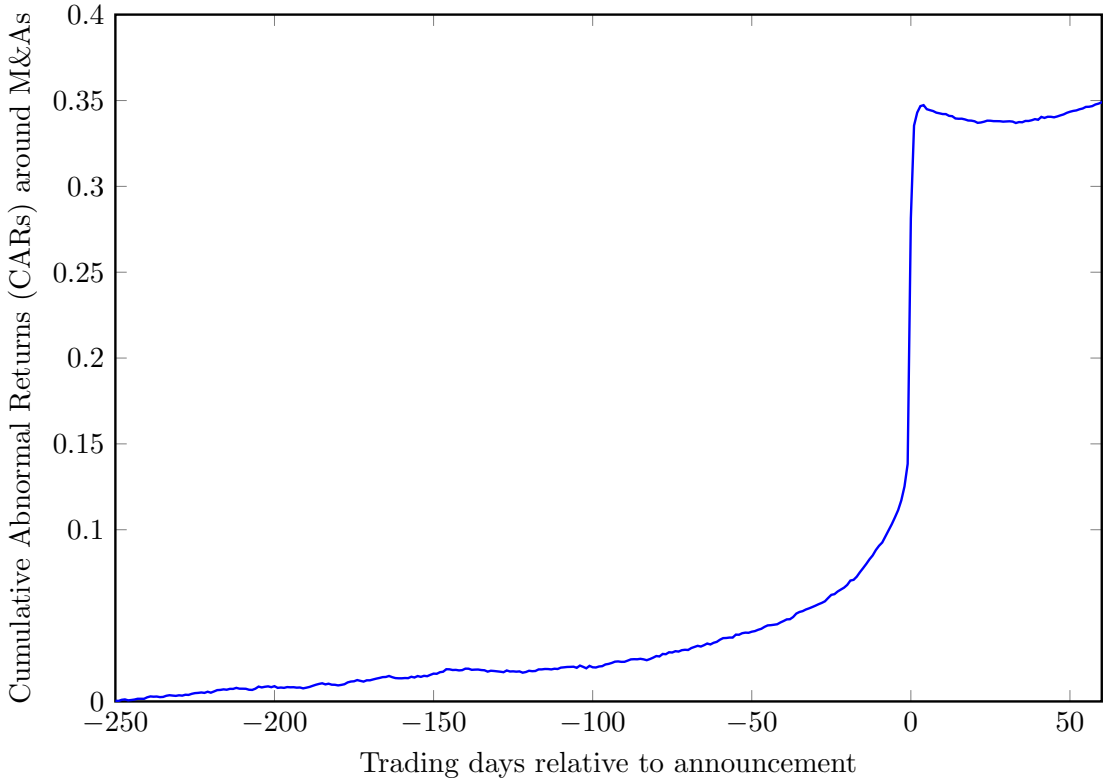

Figure 2: Mutual fund and hedge fund ownership in takeover targets around deal announcements

This figure illustrates the evolution of the mutual fund and hedge fund ownership in acquisition targets around merger announcements. We sum up all shares held by mutual funds (hedge funds) for each company in each quarter. We then obtain aggregate ownership by dividing the summed shares held by total shares outstanding. This graph displays the average ownership by mutual funds (hedge funds) across all deals in the sample several quarters prior, during, and one quarter after the announcement quarter.

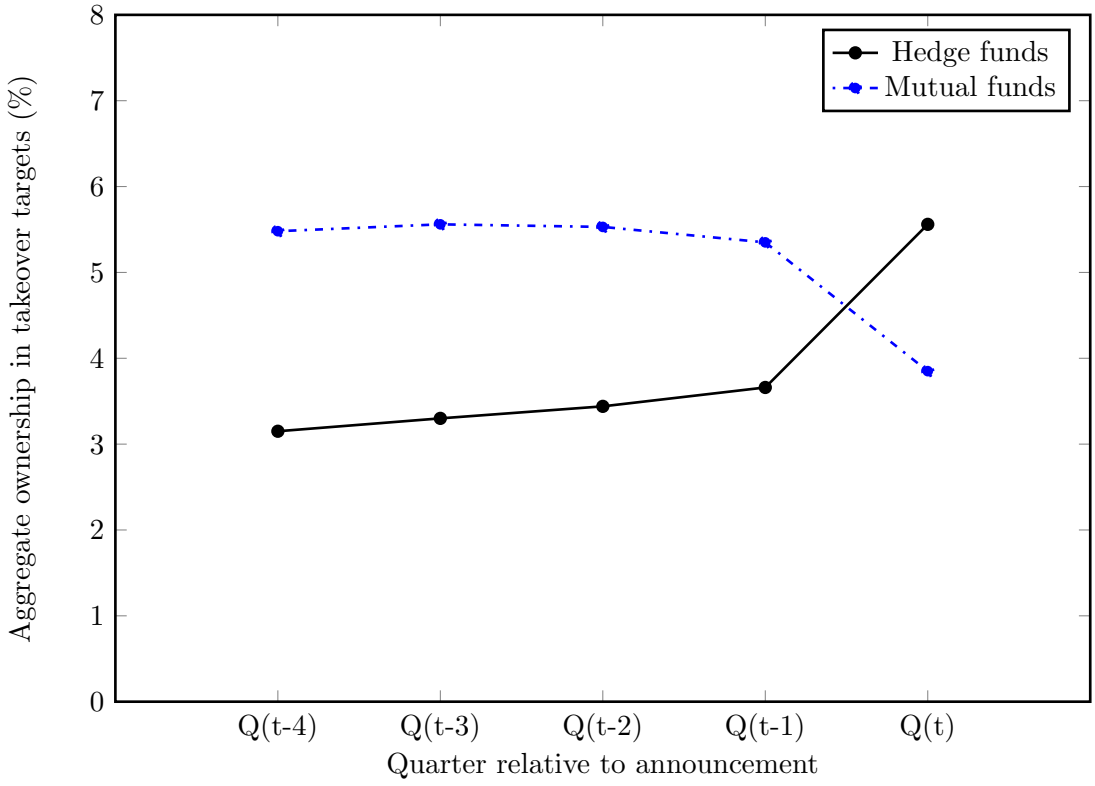

Table 1: Summary statistics

Panel A of this table reports the summary statistics of 8,666 deal characteristics. The sample runs from January 1990 to December 2015. Panel B of this table reports the descriptive statistics of 1,791 mutual funds in our sample. These statistics are calculated from 65,854 fund-by-quarter observations.

Panel A : Deal characteristics summary statistics

	Mean	Median	Std Dev	5th percentile	95th percentile
Complete ($N = 8,666$)	0.809	1.000	0.393	0.000	1.000
All cash ($N = 8,666$)	0.422	0.000	0.494	0.000	1.000
All stock ($N = 8,666$)	0.266	0.000	0.442	0.000	1.000
Competing ($N = 8,666$)	0.088	0.000	0.283	0.000	1.000
Diversifying ($N = 8,666$)	0.493	0.000	0.499	0.000	1.000
SDC premium ($N = 7,888$)	0.422	0.345	0.422	-0.073	1.199
Tender ($N = 8,666$)	0.176	0.000	0.381	0.000	1.000
Hostile ($N = 8,666$)	0.087	0.000	0.283	0.000	1.000
Target CAR3 ($N = 8,367$)	0.21	0.17	0.24	-0.07	0.66

Panel B : Mutual fund summary statistics

	Mean	Median	Std Dev	5th percentile	95th percentile
$1Q$ *fund return* (%)	2.236	2.680	10.317	-16.301	17.412
TNA (*mil*$)	1,996	418	5,430	31.2	8,667
Expense ratio (%)	1.220	1.181	0.402	0.649	1.960
Turnover ratio (%)	0.801	0.620	0.687	0.100	2.160
Age (*years*)	18	15	14	4	50
Flows (%)	0.229	-1.611	12.268	-12.313	18.420

Table 2: Mutual fund and hedge fund ownership in takeover targets

This table reports the average mutual fund and hedge fund ownership (in %) and changes in ownership in takeover targets during the M&A pre-announcement period. We denote $Q(t)$ as the merger announcement quarter. Mutual (hedge) fund ownership is the total number of shares held by mutual (hedge) funds in our sample as a fraction of total shares outstanding. This table reports mutual fund and hedge fund ownership associated with all target firms. The t-statistics are shown in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	# deals	*Mutual funds*	*Hedge funds*
$Q(t-4)$	8,300	5.48	3.15
$Q(t-3)$	8,300	5.56	3.30
$Q(t-2)$	8,300	5.53	3.44
$Q(t-1)$	8,300	5.35	3.66
$Q(t)$	7,928	3.85	5.56
$Q(t-1) - Q(t-2)$	8,300	-0.18***	0.22***
		(-4.58)	(8.63)
$Q(t-1) - Q(t-3)$	8,300	-0.21***	0.36***
		(-5.99)	(10.62)
$Q(t-1) - Q(t-4)$	8,300	-0.13***	0.51***
		(-2.79)	(12.68)
$Q(t) - Q(t-1)$	7,928	-1.50***	1.90***
		(-32.74)	(33.04)

Table 3: Mutual fund and hedge fund ownership in takeover targets by subsamples

This table reports the average mutual fund and hedge fund ownership (in %) and changes in ownership in takeover targets during the M&A pre-announcement period. We denote $Q(t)$ as the merger announcement quarter. Mutual (hedge) fund ownership is the total number of shares held by mutual (hedge) funds in our sample as a fraction of total shares outstanding. This table reports mutual fund and hedge fund ownership associated for the targets sorted on the basis of CARs, SDC premium, tender (non-tender) offers, and announcement period. The t-statistics are shown in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A : Split by the timing of the deal announcement

	Deals announced in the first 20 days (N=1,699)		Deals announced in the last 20 days (N=1,902)		Deals announced in middle of the event quarter (N=4,699)	
	MF	HF	MF	HF	MF	HF
$Q(t-4)$	5.85	3.27	5.22	3.05	5.46	3.15
$Q(t-3)$	5.87	3.36	5.24	3.18	5.58	3.33
$Q(t-2)$	5.74	3.52	5.34	3.29	5.53	3.47
$Q(t-1)$	5.43	3.82	5.20	3.51	5.38	3.67
$Q(t-1)-Q(t-2)$	-0.31***	0.30***	-0.14*	0.22***	-0.15***	0.20***
	(-3.54)	(5.31)	(-1.70)	(3.77)	(-2.94)	(5.91)
$Q(t-1)-Q(t-4)$	-0.42***	0.55***	-0.01	0.46***	-0.08	0.52***
	(-3.96)	(5.96)	(-0.16)	(5.65)	(-1.23)	(9.66)

Panel B : Split by the time period

	Deals announced 1990-2001 (N=4,728)		Deals announced 2002-2015 (N=3,572)	
	MF	HF	MF	HF
$Q(t-4)$	4.07	1.28	7.35	5.63
$Q(t-3)$	4.19	1.37	7.37	5.85
$Q(t-2)$	4.17	1.41	7.33	6.13
$Q(t-1)$	4.02	1.53	7.11	6.49
$Q(t-1)-Q(t-2)$	-0.15***	0.12***	-0.22***	0.36***
	(-2.83)	(4.74)	(-4.13)	(7.22)
$Q(t-1)-Q(t-4)$	-0.05	0.25***	-0.24***	0.86***
	(-0.83)	(6.37)	(-3.53)	(1.05)

Continued on next page

Table 3 – *Continued*

Panel C : Split by SDC premium (available for 7,888 deals)

	Deals with premium above the median		Deals with premium below the median	
	MF	HF	MF	HF
$Q(t-4)$	5.28	3.05	6.17	3.23
$Q(t-3)$	5.14	3.16	6.18	3.41
$Q(t-2)$	5.38	3.27	6.17	3.57
$Q(t-1)$	5.21	3.47	5.98	3.83
$Q(t-1)-Q(t-2)$	-0.17***	0.20***	-0.19***	0.26***
	(-3.08)	(5.43)	(-3.29)	(6.70)
$Q(t-1)-Q(t-4)$	-0.07	0.42***	-0.19***	0.60***
	(-1.21)	(7.42)	(-2.84)	(10.32)

Panel D : Split by CARs

	Deals with CARs above the median		Deals with CARs below the median	
	MF	HF	MF	HF
$Q(t-4)$	5.70	3.51	5.27	2.82
$Q(t-3)$	5.82	3.65	5.32	2.97
$Q(t-2)$	5.76	3.77	5.31	3.13
$Q(t-1)$	5.58	3.88	5.14	3.46
$Q(t-1)-Q(t-2)$	-0.18***	0.11***	-0.17***	0.33***
	(-3.33)	(3.16)	(-3.09)	(8.70)
$Q(t-1)-Q(t-4)$	-0.12*	0.37***	-0.13***	0.64***
	(-1.80)	(6.87)	(-2.14)	(10.83)

Panel E : Split by tender offers

	Tender offers (N=1,476)		Non-tender offers (N=6,824)	
	MF	HF	MF	HF
$Q(t-4)$	6.64	3.86	5.23	2.99
$Q(t-3)$	6.64	3.94	5.33	3.16
$Q(t-2)$	6.73	4.11	5.27	3.29
$Q(t-1)$	6.11	4.33	5.19	3.52
$Q(t-1)-Q(t-2)$	-0.62***	0.22***	-0.08***	0.23***
	(-5.73)	(3.50)	(-3.02)	(7.88)
$Q(t-1)-Q(t-4)$	-0.53***	0.47***	-0.04	0.53***
	(-4.29)	(4.55)	(-0.83)	(11.91)

Table 4: Mutual fund and hedge fund trading in targets and takeover probability

This table reports the logit regression results relating mutual and hedge fund ownership levels and changes with the probability of a firm becoming a takeover target. We use all firms in CRSP for the period 1990-2015 as the universe of stocks. We run the logit regression with a dependent variable equal to 1 if a firm is a takeover target, and 0, otherwise. The key explanatory variables are the mutual fund (MF) and hedge fund (HF) ownership in levels and changes. To obtain the aggregate ownership by mutual (hedge) funds, we sum up all shares held by mutual (hedge) funds and divide by total shares outstanding (TSO). Other controls include one-year return, market-to-book ratio, and a natural logarithm of market capitalization. All continuous variables are winsorized at the 1% level. Standard errors are clustered at the firm level. P-values are reported in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable = Target (0, 1) in $Q(t)$					
	(1)	(2)	(3)	(4)	(5)
Δ(MF ownership/TSO)$_{t-2\to t-1}$	-1.017***	-1.138***			-0.785***
	(0.000)	(0.000)			(0.000)
Δ(MF ownership/TSO)$_{t-3\to t-2}$	-1.148***	-1.156***			-0.655***
	(0.000)	(0.000)			(0.000)
Δ(MF ownership/TSO)$_{t-4\to t-3}$	-0.350**	-0.300			0.268
	(0.028)	(0.105)			(0.146)
Δ(HF ownership/TSO)$_{t-2\to t-1}$			1.279***	1.497***	1.898***
			(0.000)	(0.000)	(0.000)
Δ(HF ownership/TSO)$_{t-3\to t-2}$			0.877***	1.174**	1.831***
			(0.002)	(0.002)	(0.000)
Δ(HF ownership/TSO)$_{t-4\to t-3}$			1.106***	1.679***	2.451***
			(0.000)	(0.000)	(0.000)
(MF ownership/TSO)$_{t-4}$					0.733***
					(0.000)
(HF ownership/TSO)$_{t-4}$					2.725***
					(0.000)
1-year stock return$_{t-1}$		-0.012		-0.022**	-0.017*
		(0.179)		(0.018)	(0.076)
Market-to-book$_{t-1}$		-0.003**		-0.004**	-0.003**
		(0.016)		(0.014)	(0.017)
Log(mkt cap)$_{t-1}$		-0.027***		-0.028***	-0.043***
		(0.000)		(0.000)	(0.000)
Intercept	-2.573***	-2.003***	-2.552***	-1.999***	-1.864***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Time (quarter) and 2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes
N	672,519	439,482	672,519	439,482	439,482

Table 5: Ownership by mutual fund affiliated with M&A advisors

Panel A reports target ownership by mutual funds whose management company serves as an M&A advisor to target and/or bidder firms in quarters prior to merger announcements. Panel B of this table reports the ownership by high-value funds affiliated with investment companies that advise M&A targets during the deal pre-announcement period. Following Gaspar, Massa, and Matos (2006), we identify high-value funds as those that either charge the highest fees, or show the strongest performance, or are the youngest relatively to other funds in fund family. T-statistics are reported in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A : Ownership (%) by funds whose management company serves as an M&A advisor

Management company is among a *target's* M&A advisors						
Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
0.051	0.055	0.063	0.063	0.008**	0.012***	-0.000
				(1.93)	(2.42)	(-0.03)
Management company is among an *acquirer's* M&A advisors						
Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
0.062	0.059	0.055	0.048	-0.004	-0.014***	-0.007*
				(-1.13)	(-2.77)	(-1.85)
Management company is either among a *target's* M&A advisors or among an *acquirer's* M&A advisors						
Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
0.078	0.079	0.081	0.079	0.002	0.001	-0.002
				(0.51)	(0.32)	(-0.52)

Continued on next page

Table 5 – *Continued*

Panel B : Ownership (%) by high-value funds affiliated with management companies that advise M&A targets

High value funds whose management company is among a target's M&A advisors						
Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
0.030	0.028	0.034	0.034	0.006	0.004	0.000
				(1.51)	(0.87)	(0.00)
The youngest funds in the family that is among a target's M&A advisors						
Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
0.005	0.007	0.010	0.015	0.003**	0.010***	0.005**
				(2.46)	(3.56)	(2.30)
The highest-fee funds in the family that is among a target's M&A advisors						
Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
0.013	0.009	0.015	0.010	0.006***	-0.003	-0.005**
				(2.69)	(-1.52)	(-2.21)
Funds with strongest performance in the same investment objective category and whose family is among a target's advisors						
Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
0.018	0.019	0.021	0.018	0.002	0.000	-0.003
				(0.58)	(0.01)	(-1.14)
The youngest funds relatively to other funds in the family (families with and without advisor roles)						
Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
0.610	0.608	0.607	0.602	-0.001	-0.008	-0.005
				(-0.17)	(-0.62)	(-0.45)
Funds with strongest performance relatively to other funds with the same investment objective (families with and without advisor roles)						
Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
1.067	1.079	1.096	1.096	0.017	0.029	-0.000
				(0.94)	(1.29)	(-0.01)
Funds that charge highest fees relatively to other funds in the family (families with and without advisor roles)						
Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
0.761	0.757	0.746	0.720	-0.011	-0.041**	-0.026**
				(-0.89)	(-2.02)	(-2.50)

Table 6: Ownership by hedge fund activists

Panel A reports percent of total shares outstanding held by hedge fund activists in all target firms in our sample. Panel B reports the hedge fund activist ownership in 79 activism targets that are also M&A targets held by hedge funds that file a Schedule 13D within one year before the merger announcement date. The last panel of this table shows the evolution in ownership in these 79 firms by non-activist hedge funds. Panels D and E report hedge fund ownership for transactions excluding the activist hedge funds, and all hedge fund ownership in the 79 activism and takeover targets, respectively. T-statistics are reported in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A : Hedge fund activists; ownership (%) in all M&A targets (8,300 deals)

Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
0.042	0.054	0.065	0.080	0.011***	0.038***	0.015***
				(2.98)	(5.63)	(3.76)

Panel B : Hedge fund activists; ownership (%) in M&A and activism targets (79 deals)

Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
6.35	7.70	9.03	11.36	1.33***	5.01***	2.33***
				(2.94)	(5.69)	(3.08)

Panel C : Non-activist hedge funds; ownership (%) in M&A and activism targets (79 deals)

Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
12.34	14.54	15.39	16.03	0.85	3.69**	0.64
				(0.87)	(2.38)	(0.82)

Panel D : Hedge fund ownership in M&A targets *excluding* activists (8,300 deals)

Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
3.03	3.15	3.28	3.49	0.13***	0.46**	0.21***
				(5.59)	(11.64)	(8.17)

Panel E : Hedge fund ownership in M&A and activism targets (79 deals)

Q(t-4)	Q(t-3)	Q(t-2)	Q(t-1)	Q(t-2)-Q(t-3)	Q(t-1)-Q(t-4)	Q(t-1)-Q(t-2)
18.69	22.24	24.42	27.38	2.18**	8.69***	2.96***
				(1.97)	(4.68)	(2.65)

Table 7: Mutual fund trading in takeover targets and fund activeness

This table reports the relation between trading targets and fund activeness. For each deal, we 'inner merge' all funds in the sample that exist at the time of the deal announcement. The unit of observation is fund×deal. The dependent variable is a fund's difference in $log(1 + sharesadj_(t-1))$ and $log(1 + sharesadj_(t-2))$, given that (t) is the announcement quarter. If a fund does not hold a potential target, its number of adjusted shares is 0. All continuous variables are winsorized at the 1% level. All independent variables are measured as of quarter $(t-2)$, unless specified. Standard errors are clustered at the fund level. All coefficients are multiplied by 1,000. T-statistics are reported in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Active share		Tracking error		Fund (1-R^2)		| Return gap |	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Active management	0.172***	0.165***	0.411***	0.346***	0.027***	0.043***	0.728*	0.655
	(4.11)	(3.98)	(4.31)	(4.25)	(5.61)	(7.77)	(1.83)	(0.99)
Fund characteristics								
1Q fund return		-0.088		-0.057		-0.016***		-0.095*
		(-1.14)		(-0.78)		(-2.49)		(-1.67)
Log(TNA)		-0.004*		-0.005**		-0.003		-0.004**
		(-1.72)		(-2.17)		(-1.33)		(-1.98)
Log(Age)		0.018***		0.017**		0.022***		0.020***
		(2.86)		(2.64)		(3.38)		(3.33)
Expense ratio		2.236*		3.289***		3.883**		4.275***
		(1.92)		(2.48)		(3.31)		(3.60)
Turnover ratio		-0.010**		-0.011***		-0.013***		-0.011**
		(-2.55)		(-2.82)		(-2.73)		(-2.35)
Flows		0.040***		0.037**		0.040**		0.055***
		(2.70)		(2.53)		(2.48)		(3.88)
Deal characteristics								
Hostile		-0.039***		-0.039***		-0.016*		-0.017*
		(-2.90)		(-2.91)		(-1.66)		(-1.83)
Tender		0.002		0.002		0.008		0.009
		(0.23)		(0.23)		(1.37)		(1.54)
100% stock		0.053***		0.053***		0.054***		0.052***
		(8.70)		(8.70)		(11.56)		(11.42)
100% cash		0.034***		0.034***		0.028***		0.027***
		(5.49)		(5.49)		(6.13)		(5.98)
Completed		-0.019***		-0.019***		-0.018***		-0.018***

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Table 7 – *Continued*

		(-2.58)		(-2.59)		(-2.94)		(-3.05)
Competing		-0.079***		-0.079***		-0.064***		-0.063***
		(-4.61)		(-4.61)		(-4.99)		(-5.00)
CAR3		0.025**		0.025**		0.034***		0.032***
		(2.37)		(2.37)		(4.05)		(3.97)
Target characteristics								
Log(mkt cap)		-0.039***		-0.039***		-0.042***		-0.040***
		(-13.16)		(-13.16)		(-15.98)		(-15.98)
1Q stock return$_{t-2}$		0.054***		0.054***		0.063***		0.058***
		(5.62)		(5.62)		(6.94)		(6.84)
1Q stock return$_{t-1}$		-0.037***		-0.037***		-0.032***		-0.031***
		(-5.54)		(-5.53)		(-4.93)		(-5.23)
Share turnover		0.010***		0.010***		0.010***		0.009***
		(7.99)		(7.99)		(8.58)		(8.41)
Intercept	-0.941	0.547***	0.058	0.650***	0.079	0.866**	0.047**	0.778***
	(-0.98)	(9.84)	(0.07)	(12.55)	(3.46)	(15.72)	(2.00)	(15.66)
Time (quarter) and 2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2(%)	1.25	1.33	1.24	1.33	1.17	1.35	1.22	1.35
# of observations	2,745,013	2,371,822	2,744,910	2,371,822	7,712,852	3,960,281	8,489,981	4,016,606

Table 8: Mutual fund trading in takeover targets and fund activeness: Control sample

Panel A reports the results from the propensity score matching analysis. Panel B reports the results of analyses for the sample of funds and the control group, generated from the propensity score matching procedure. We follow the methodology similar to that described for Table 7. However, instead of the set of takeover targets, we use the control group sample. In addition, since the control group contains untreated observations, we are not able to control for deal characteristics. We control for fund and stock characteristics that include a fund's size, portfolio return, age, expense ratio, turnover ratio, flows, as well as a stock's market capitalization, return, and turnover. The dependent variable is a fund's difference in $log(1+sharesadj_(t))$ and $log(1+sharesadj_(t-1))$ If a fund does not hold a stock that belongs to the control group, its number of adjusted shares is 0. All continuous variables are winsorized at the 1% level. Standard errors are clustered at the fund level. Coefficients are multiplied by 1,000. T-statistics are reported in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A :The propensity score matching analysis - first stage

Dependent variable = Target(0, 1) in quarter t		Treatment sample mean	Control sample mean	Pr(diff)
Log(mktcap)$_{t-1}$	-0.023***	18.913	18.872	(0.244)
	(-7.97)			
1Q return$_{t-1}$	0.093***	0.038	0.041	(0.459)
	(4.66)			
1Q return$_{t-2}$	-0.125***	0.006	0.009	(0.493)
	(-5.89)			
1Q return$_{t-3}$	-0.063**	0.018	0.016	(0.662)
	(-2.99)			
Market-to-book$_{t-1}$	-0.005***	2.395	2.401	(0.931)
	(-3.45)			
Liquidity$_{t-1}$	-0.004	0.171	0.174	(0.448)
	(-0.16)			
Leverage$_{t-1}$	0.033	0.218	0.219	(0.916)
	(1.27)			
Intercept	Yes			
Time (quarter) and SIC2dig fixed effects	Yes			
Pseudo R^2	2.21			
Regression p-value	0.000			

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Table 8 – *Continued*

Panel B :Mutual fund trading and fund activeness - Control sample

	Active share		Tracking error		Fund (1-R^2)		| Return gap |	
Active management	-0.184***	-0.195***	-0.374***	-0.376***	-0.056***	-0.010	0.751	-1.297
	(-5.79)	(-5.92)	(-5.57)	(-5.86)	(-2.94)	(-0.42)	(1.43)	(-1.59)
Intercept	0.0167***	-0.725***	0.051***	-0.847***	0.036***	0.111	0.333***	0.117
	(6.34)	(-9.65)	(7.41)	(-11.17)	(3.80)	(1.43)	(3.09)	(1.57)
Stock and fund controls	No	Yes	No	Yes	No	Yes	No	Yes
Time and 2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (%)	0.92	0.96	0.91	0.96	1.13	1.35	1.18	1.11
# of observations	1,952,332	1,740,307	1,952,279	1,740,307	5,536,483	3,005,478	5,994,747	3,024,646

Table 9: Persistence in mutual fund and hedge fund weights

We sort all mutual funds based on the total portfolio weights of holdings in one or more M&A targets at the end of the quarter prior to the announcement quarter after eliminating those with zero-weights in target firms. We form terciles based on the weight allocated by mutual funds in each tercile in $Q(t)$ to firms that become targets in $Q(t+1)$. We compute their portfolio weights in to-be targets in $Q(t+2)$ and $Q(t+3)$. Panel A reports average weights allocated to to-be targets by mutual funds in each tercile formed in $Q(t-1)$. Following this approach, we report average weights allocated to future takeover targets by hedge funds in Panel B. We calculate the differences in average weights for the highest and lowest terciles, and report Newey-West-adjusted t-statistics. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A : Mutual funds					
$\omega_{t-1} \neq 0$					
Tercile	$\omega_{t-1}(\%)$	$\omega_t(\%)$	$\omega_{t+1}(\%)$	$\omega_{t+2}(\%)$	$\omega_{t+3}(\%)$
Lowest	0.45	0.57	0.70	0.57	0.71
Middle	1.30	0.68	0.84	0.70	0.81
Highest	3.36	0.75	0.89	0.74	0.91
Highest-Lowest	2.91***	0.18***	0.19***	0.17***	0.20***
	(23.80)	(4.73)	(5.45)	(4.15)	(6.03)
$\omega_{t-1} = 0$					
	$\omega_{t-1}(\%)$	$\omega_t(\%)$	$\omega_{t+1}(\%)$	$\omega_{t+2}(\%)$	$\omega_{t+3}(\%)$
	0	0.50	0.44	0.51	0.47
Panel B : Hedge funds					
$\omega_{t-1} \neq 0$					
Tercile	$\omega_{t-1}(\%)$	$\omega_t(\%)$	$\omega_{t+1}(\%)$	$\omega_{t+2}(\%)$	$\omega_{t+3}(\%)$
Lowest	0.39	1.31	1.28	1.28	1.27
Middle	1.54	1.40	1.34	1.38	1.43
Highest	7.21	2.07	1.77	1.80	1.70
Highest-Lowest	6.82***	0.76***	0.49***	0.52***	0.43***
	(15.28)	(2.98)	(5.90)	(5.03)	(4.74)
$\omega_{t-1} = 0$					
	$\omega_{t-1}(\%)$	$\omega_t(\%)$	$\omega_{t+1}(\%)$	$\omega_{t+2}(\%)$	$\omega_{t+3}(\%)$
	0	1.27	1.26	1.25	1.22

Appendices

Variable	Definition
Fund characteristics	
$Log(Age)$	The natural logarithm of fund age (years)
Expense ratio	Mutual fund expense ratio
Turnover ratio	Mutual fund turnover ratio
$Log(TNA)$	The natural logarithm of total net assets under management (TNA)
Flows	The quarterly growth rate of assets under management after adjusting for the appreciation of fund's assets (in %)
$1Q$ *fund return*	The fund's quarterly return, obtained by compounding monthly returns net of expense
4-*factor alpha*	The abnormal return from the Carhart (1997) four-factor models. For each fund, time-series regressions of excess monthly fund returns on four zero-investment factor portfolios along dimensions of excess market return, size, value, and momentum are estimated using the preceding 36 months of data. As in Carhart (1997), the abnormal performance at time $\tau+1$ is computed by taking the fund return at time $\tau+1$ in excess of the risk-free rate and subtracting the fitted value of the return using the factor loadings estimated over the prior 36 months. The quarterly alphas are obtained by accumulating monthly fund alphas within each quarter
MF (HF) *ownership*	The total number of shares held by mutual funds (hedge funds) as a fraction of total shares outstanding
Measures of active management	
Active Share	The share of portfolio holdings that differs from the benchmark index holdings, as in Cremers and Petajisto (2009)
Tracking error	The standard deviation of residuals obtained from regressing fund returns on excess index returns, as in Cremers and Petajisto (2009)
Fund R^2	R^2, generated from regressing excess monthly fund returns net of expenses on four factors, using 36-month rolling windows, as suggested by Amihud and Goyenko (2013)
Return gap	The difference between the reported fund return and the return on a portfolio that invests in the previously disclosed fund holdings, as in Kacperczyk, Sialm, and Zheng (2008)
Target characteristics	
Log(*mkt cap*)	The natural logarithm of a target's market capitalization (price×total shares outstanding)
$1Q$ *stock return*	The target's one-quarter return, obtained by compounding monthly returns
Share turnover	The three-month average ratio of trading volume to total shares outstanding

$CAR3$	The target's cumulative abnormal three-day return over the window around the merger announcement date. It is calculated as the residual from the four-factor model estimated during the one-year period ending four weeks prior to the merger anouncement
TSO	Total shares outstanding
$Market\text{-}to\text{-}book$	A stock's market capitalization over the book value of common equity (Quarterly Compustat item Data59)
$Liquidity$	Cash and short-term investments (Compustat item Data36) over total assets (Data44)
$Leverage$	A sum of debt in current liabilities (Compustat item Data45) and long-term debt (Data51) as a fraction of total assets (Data44)
Deal characteristics	
$Completed$	=1, if a deal is completed; and 0, otherwise
$All\ cash$	=1, if payment is 100% in cash; and 0, otherwise
$All\ stock$	=1, if payment is 100% in stock; and 0, otherwise
$Hostile$	=1, if a bid is hostile as defined in SDC; and 0, otherwise
$Competing$	=1, if there are multiple bidders for a target; and 0, otherwise
$Diversifying$	=1, if the target and the acquirer operate in different industries, as reported in SCD; and 0, otherwise
$Tender\ offer$	=1, if the deal type is a tender offer; and 0, otherwise
$Anticipated$	=1, if there was at least one merger announcement in a target's industry for the past year; and 0, otherwise. Four-digit SIC codes in SDC are used to identify industries.