INSTITUTIONAL TRADING AROUND M&A ANNOUNCEMENTS

Eliezer Fich
Viktoriya Lantushenko
Clemens Sialm

ABSTRACT

Takeover targets often experience substantial share price appreciations around public announcements of mergers and acquisitions. We analyze hedge fund and mutual fund holdings around takeover announcements to assess the differences in investment strategies across institutions. Our results indicate that hedge funds in the aggregate increase their holdings of soon-to-be takeover targets by 7.2% during the quarter prior to the public announcement. Conversely, mutual funds reduce their equity holdings in impending targets by 3.0% during the quarter before M&A announcements and therefore potentially forgo profitable investment opportunities.

Eliezer Fich
Finance Department
Drexel University
Philadelphia, PA 19104
efich@drexel.edu

Viktoriya Lantushenko
Saint Joseph's University
Haub School of Business
5600 City Avenue
Philadelphia, PA 19131
vlantush@sju.edu

Clemens Sialm
University of Texas at Austin
McCombs School of Business
2110 Speedway; B6600
Austin, TX 78712-1276
and NBER
clemens.sialm@mccombs.utexas.edu

1   Introduction

Mergers and Acquisitions (M&A) often generate substantial appreciation of the targets' equity. As Figure 1 illustrates, the stock prices of target companies increase on average by more than 20% immediately after the public announcements of M&A transactions. Trading in anticipation of these announcements can significantly improve the performance of an investment strategy.[1] In this paper, we analyze the holdings of hedge funds and mutual funds around takeover announcements to better understand the investment strategies of these two types of institutions.

Different types of investors might have different access to private information or distinct abilities to process public information since they exhibit various regulatory restrictions, compensation structures, and trading strategies. For example, whereas mutual funds face significant regulatory restrictions and disclosure requirements, hedge funds are less regulated and offer limited transparency. Also, the compensation of hedge fund managers is typically more performance sensitive than the compensation of mutual fund managers. Moreover, although mutual funds frequently follow more straight-forward long-only investment strategies, hedge funds often take advantage of more complex investment strategies that use derivatives, short-selling, and leverage.[2] Consequently, the incentives and the ability to obtain private information and process complex public information is likely to vary by institutional type.

To study the trading strategies of institutional investors around M&A deals, we analyze a sample of 7,184 M&A announcements from 1990 through 2015. Our main results show that

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[1] As noted by Jensen and Ruback (1983), Holmström and Kaplan (2001), Betton, Eckbo, and Thorburn (2008), and many others, M&A deals are among the main events of corporations.

[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), 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), Aragon, Hertzel, Shi (2013), Maslennikov and Hund (2015), Swem (2015), Gao and Huang (2016), Gargano, Rossi, and Wermers (2017), Crane, Crotty, and Umar (2018), Kumar, Mullally, Ray, and Tang (2018), and Qian and Zhong (2018).

hedge funds substantially *increase* their holdings in takeover candidates before the merger announcement. In contrast, we find that mutual funds *reduce* their exposure to takeover candidates before the merger announcement. The target ownership changes in takeover targets by both mutual funds and hedge funds are not only statistically significant but also economically important. On average, hedge fund ownership in impending takeover targets increases by 7.2% (from 3.74% to 4.02% of shares outstanding) during the quarter prior to the merger announcement. On the other hand, mutual fund ownership in takeover targets decreases by 3.0% (from 11.82% to 11.46% as a fraction of the target's shares outstanding) during the calendar quarter preceding the public merger announcement. The decline in mutual fund ownership of to-be takeover targets becomes more pronounced if we adjust for the change in mutual fund ownership in peer firms with similar characteristics over our sample period. Notably, at least some of the decline in mutual fund ownership can be attributed to an equilibrium response to the increase in ownership of hedge funds.

Although our analysis focuses mostly on the portfolio changes in the quarters prior to the public announcement of an M&A transaction, we find that the ownership changes further accelerate during the announcement quarter. Mutual fund ownership decreases by 27.2% (from 11.46% to 8.39% of shares outstanding) and hedge fund ownership increases by 53.0% (from 4.02% to 6.13% of shares outstanding) during the quarter the M&A transaction is publicly announced. Using daily mutual fund returns we find that, during the M&A announcement quarter, most of the ownership change occurs after the deal is announced. Mutual funds are less interested in the target stock after the M&A announcement, since the stock price of the target will depend primarily on the stock price of the acquirer (if the target shareholders are paid in shares of the acquiring company) or on the offer price (if the target shareholders are paid in cash). Conversely, the increase in hedge fund ownership during the announcement quarter is consistent with merger arbitrage strategies, as discussed by Mitchell and Pulvino (2001), Baker and Savasoglu (2002), Hsieh and Walking (2005), and Jiang, Li, and Mei (2016).

To investigate whether our results are affected by Regulation Fair Disclosure (Reg-FD),

which requires that all material information be shared with all investors at the same time, we compare the ownership changes before and after 2001. Our results indicate qualitatively similar effects before and after the regulatory change. Furthermore, the ownership changes are also robust across transactions of different sizes, different takeover premia, and different deal characteristics.

In an analysis of all publicly-traded firms, we find that increases in hedge fund ownership and decreases in mutual fund ownership over several quarters increase the probability that a company becomes a takeover target in subsequent quarters. This analysis also allows us to control for common characteristics of the companies (e.g., industry, size, market-to-book, momentum) that might be used as trading signals by institutional investors. We find that the ownership changes by mutual funds and hedge funds remain an economically and statistically significant predictor of M&A transactions after controlling for these style characteristics. These results indicate that the trading decisions of mutual funds and hedge funds are not subsumed by these common characteristics.

Our results on ownership changes might be affected by the affiliation of fund management companies with the advisors for the acquirers and targets, as previously discussed by Bodnaruk, Massa, and Simonov (2009). These asset management firms might obtain early access to the information about a forthcoming acquisition. We find that the ownership in a target firm by mutual funds affiliated with the target's M&A advisor increases slightly several quarters prior to the M&A announcement. Conversely, we note that the ownership in a target firm by mutual funds affiliated with the acquirer's M&A advisor declines in the quarters prior to the M&A announcement, consistent with our overall results. Thus, trading by affiliated investors does not explain our results in the overall sample.

We also study whether our hedge fund results are driven by the activist hedge funds identified by Brav, Jiang, and Kim (2015). Of the 7,184 M&A takeover targets in our sample, only 76 are associated with hedge fund activism. Our results show that hedge fund activists significantly increase their stakes in these 76 target companies prior to M&A deal announcements. In contrast, ownership changes by non-activist hedge funds are less

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pronounced. These findings suggest activism as a possible channel that some hedge funds may use to generate gains. However, the ownership changes by activist hedge funds cannot explain the vast majority of the trading in takeover targets prior to the announcement.

Next, we analyze whether there are important cross-sectional differences among institutional investors who trade the targets' equity prior to merger announcements. We find significant persistence in the ownership stakes held across time by both mutual funds and hedge funds. Specifically, funds that allocate a higher weight in to-be targets a quarter prior to the announcement tend to allocate a higher portfolio weight to future targets as well. This evidence indicates that there are systematic differences in allocations toward upcoming targets across funds.

While a substantial literature documents that the performance of mutual funds and other investors is related to several fund characteristics,[3] there is a paucity of research on the specific investment strategies that they use to generate abnormal performance. We study whether the allocation to future target companies is related to the activeness of a fund. We use three different proxies for active management: the Active Share of Cremers and Petajisto (2009), the R^2 of Amihud and Goyenko (2013), and the absolute value of the Return Gap of Kacperczyk, Sialm, and Zheng (2008). We find that mutual funds that are more actively managed tend to decrease their ownership of future takeover targets to a lesser extent. Thus, less active funds, which have been shown to exhibit lower investment ability than more active mutual funds, tend to forgo the largest benefits of takeover announcements by selling out their shares in takeover targets prematurely.

Our work contributes to the active debate on whether institutional investors profit from takeover announcements. Jegadeesh and Tang (2010) 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. Similarly, Lowry, Rossi, and

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[3]See for example, Carhart (1997), Wermers (2000), Chen, Jagadeesh, and Wermers (2000), Kacperczyk, Sialm, and Zheng (2005, 2008), Gaspar, Massa, and Matos (2006), Massa and Rehman (2008), Bodnaruk, Massa, and Simonov (2009), Cremers and Petajisto (2009), Agrawal and Nasser (2012), Edmans, Goldstein, and Jiang (2012), Amihud and Goyenko (2013), Berk and Van Binsbergen (2015), Pastor, Stambaugh, and Taylor (2015), Cremers, Ferreira, Matos, and Starks (2016), and Jiang and Zheng (2018).

Zhu (2018) use evidence from options holdings to find that advisor banks trade in client firms ahead of merger announcements In contrast, Griffin, Shu, and Topaloglu (2012) do not find much evidence to support that investment bank clients take advantage of takeover advising connections. Whereas those papers are primarily interested in short-term trading immediately prior to the merger announcement, we analyze trades over longer horizons for a broader set of mutual fund and hedge funds. We add to this literature by showing that, unlike mutual funds, some hedge funds accumulate large stakes in soon-to-be takeover targets. In a related study, Dai, Massoud, Nandy, and Saunders (2017) analyze the trading by short- and long-term hedge funds around merger announcements. 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 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. Our paper moves this literature forward by showing that some investment managers create value by increasing their holdings in prospective takeover targets.

Our paper also adds important evidence to the strand of the M&A literature evaluating the role of institutional investors during these transactions (see, for example, Officer, Ozbas, and Sensoy (2010), Greenwood and Schor (2009), and Fich, Harford, and Tran (2015)).

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 provides cross-sectional evidence. Section 5 concludes.

2 Data and Sample Construction

We obtain information on M&A deals for the period of 1990 through 2015 from the SDC database. The initial sample of completed and withdrawn deals consists of 34,144 transactions with the following deal characteristics: mergers, acquisitions, and acquisitions of a majority interest. We eliminate targets that are not publicly traded and those that have a market capitalization of less than $25 million four quarters prior to the deal announcement (in real 2015 dollars). This yields 7,184 transactions.

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).[4]

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. Individual stock prices and returns are from the CRSP monthly stock file and firm characteristics are from the COMPUSTAT database.

Panel A of Table 1 provides descriptive statistics for the 7,184 M&A offers in our sample. These deals have a completion rate of 82.1%. About 42.4% of the transactions in our sample are paid fully in cash, and 26.6% are paid fully in stock. Deals with multiple bidders constitute 9.6% of our sample. In 68.1% of the offers, the deals are diversifying since both the target and the bidder operate in different industries. About 18.7% of the transactions are tender offers and 9.3% are characterized as hostile. The premium offered according to the SDC database is 40.7%. This premium is measured relative to the price four weeks prior to the announcement date. The average market capitalization of the targets is $1,420 million. However, the distribution of market capitalizations is fairly wide: the 5th percentile equals

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

$33 million and the 95th percentile equals $5,776 million. The average market-to-book ratio of the target firms is 2.4. These summary statistics are similar to those reported in other M&A studies (e.g., Gaspar, Massa, and Matos (2005), Chen, Harford, and Li (2007), and Fich, Harford, and Tran (2015)).

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 CAR for the targets in our sample is 20.5%. We find a significant increase in the prices of target companies prior to the M&A announcement, as shown previously by Keown and Pinkerton (1981) and Schwert (1996). The mean return in the year prior to the announcement for the target stock is 9.3%.

To obtain the aggregate holdings of takeover candidates by mutual funds, we sum the holdings by any mutual funds in the Thomson holdings mutual fund database over the period from 1990-2015.

For the cross-sectional results in Sections 3.7.2, 3.9, and 4, we focus on a smaller sample of 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." 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

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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. 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 smaller sample of actively-managed domestic funds contains 1,926 unique funds.

Panel B of Table 1 provides summary statistics for our sample of mutual funds. These are calculated from 70,200 fund-quarter observations. The average fund manages around \$2 billion in assets, is 19 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 2.22% per quarter and attract flows of 2.29% 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 (2018)). The activeness of a mutual fund is captured by its Active Share following Cremers and Petajisto (2009), the R-squared from Amihud and Goyenko (2013), and the absolute Return Gap over the prior 12 months from Kacperczyk, Sialm, and Zheng (2008).[5] The funds in our sample have an average Active Share of 81.4%, an average $1 - R^2$ of 13.3%, and an absolute Return Gap of 0.26%.

To construct our sample of hedge funds, we obtain institutional holdings from the Thom-

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[5]Active Share data are obtained from https://activeshare.nd.edu/. See Cremers and Pareek (2016) for additional information on the construction of the data.

son institutional holdings 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. The average hedge fund reports its holdings over a period of six years.

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 the 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 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 $Q(t) - 1$.[6] Similarly, we aggregate hedge fund ownership for each to-be target and analyze the ownership by these investors as a fraction of shares outstanding. We also report the holdings of mutual funds and hedge funds at the end of the announcement quarter $Q(t)$.

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. Panel A depicts the aggregate ownership of takeover targets, whereas Panel B reports the difference in aggregate ownership between takeover targets and matched control firms. The figures show 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

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

hedge funds, in aggregate, are *net buyers* of these potentially profitable stocks.

For both mutual funds and hedge funds, we test the statistical significance of the changes in takeover target ownership during the merger pre-announcement period. We cluster the standard errors by time, since several takeover announcements can take place in the same quarter and since the mutual fund and hedge fund holdings are available at a quarterly frequency. Table 2 reports the results. We find that mutual fund ownership in takeover targets significantly decreases by 36 basis points (from 11.82% to 11.46% of shares outstanding) 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 increases in target ownership by hedge funds during the quarters preceding the M&A announcement quarter. Hedge fund ownership in takeover targets increases by 27 basis points (from 3.74% to 4.02%) during the quarter prior to the announcement and by 63 basis points (from 3.38% to 4.02%) during the three quarters prior to the announcement.

The largest ownership changes occur during the announcement quarter. Mutual funds decrease their holdings of target stocks from 11.46% to 8.39% of shares outstanding, whereas hedge funds increase their ownership from 4.02% to 6.13%. We do not know whether the positions in takeover targets are adjusted before or after the public M&A announcements. The accumulation of target stocks by hedge funds might be due to merger arbitrage strategies by hedge funds.[7] On the other hand, mutual funds might reduce their holdings in the targets after the M&A announcement since they might not be interested in holding the shares of the acquiring firm if the deal is stock financed or since they might not be interested in holding a stock where the value depends primarily on the offer price if the deal is cash financed. We explore these issues in more detail in Section 3.7.

Panel B summarizes the number of separate mutual funds and hedge funds that own shares in the target firms. We observe that the number of mutual funds significantly de-

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[7]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). Jiang, Li, and Mei (2016) provide evidence that activist shareholders can change the course of an announced M&A deal through public campaigns.

creases from 64.39 to 62.43 and the number of hedge funds significantly increases from 5.11 to 5.47 in the quarter prior to the announcement.[8] The change in the number of mutual funds and hedge funds (i.e., extensive margin) accounts for most of the change in the aggregate ownership proportion of these institutions. On the other hand, the change in the ownership share conditional on owning the target firm (i.e., intensive margin) is relatively small. Thus, the ownership changes are driven primarily by exits and entries of institutions and not by partial reallocation or rebalancing among institutions owning the target stocks.

It is at first glance surprising that mutual funds reduce their holdings in companies that are subsequently becoming takeover candidates. These funds might forgo significant gains by prematurely selling these companies due to the large announcement effects. However, it must be recognized that if one type of investor accumulates some securities then it is necessary that another type of investor decumulates these securities in equilibrium. Thus, as hedge funds build up positions in impending takeover candidates other investors, such as mutual funds, have to liquidate their positions. These results are consistent with the hypothesis that hedge funds have superior information or better information processing ability than mutual funds, as least with respect to M&A announcements.

3.2   Economic Magnitude

We estimate the economic effects of changing institutional ownership prior to merger announcements by calculating the dollar amount of these changes in target holdings. We multiply the change in aggregate mutual fund shares (in the quarter prior to the M&A announcement) by the end-of-quarter target share price. Mutual funds, on average, reduce their holdings in to-be targets on average by $2.95 million. In contrast, hedge funds increase their holdings in target firms, on average, by $3.83 million.

To consider various scenarios of the dollar amount associated with declining mutual

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[8]The number of hedge fund owners corresponds to the number of management companies that own specific stocks, since the 13-F filings by hedge funds are reported at the management company and not the fund level. The number of unique hedge fund owners can therefore be larger since a management company can have multiple distinct hedge funds.

fund ownership (including price run-ups, announcement premiums, and price markups), we multiply the aggregate change in shares during the quarter prior to the announcement by the price change from the end of the prior quarter to the day prior to the announcement (i.e., run-up), the price change from one day before to one day after the announcement (i.e., premium), and the price change from one day after to 60 days after the announcement (i.e., markup).[9] The average values for mutual funds across the $7,184$ deals amount to $-\$344,523$ for the run-up, $-\$775,006$ for the premium, and $-\$350,818$ for the markup. Thus, the mutual fund sector as a whole leaves significant "money on the table" by trading the target stocks prematurely.

Using a similar procedure, we find that the hedge fund sector gains, on average, for each deal as a result of increasing their ownership in to-be targets in the quarter prior to the announcement: $\$204,571$ from the run-up, $\$350,062$ from the premium, and $\$101,325$ from the markup. Overall, our evidence suggests that mutual funds in the aggregate are not informed about upcoming merger announcements. In contrast, many hedge funds are either informed about future deal announcements or are skillful enough to predict these events.

3.3 Matched Subsample

Table 3 reports the ownership proportion by mutual funds and hedge funds for the target firms and for the matched control firms. Firms are matched by industry classification, market capitalization, and book-to-market ratio.[10] Although mutual fund ownership in

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[9]The run-up is defined as $(N_{Q(t)-1} - N_{Q(t)-2}) \times (P_{t-1} - P_{Q(t)-1})$, where $N_{Q(t)-1}$ is the number of shares held at the end of the quarter immediately preceding the announcement quarter, $N_{Q(t)-2}$ is the number of shares held at the end of the quarter two quarters prior to the announcement quarter, P_{t-1} is the price of the target stock on the trading day prior to the announcement, and $P_{Q(t)-1}$ is the price of the target stock at the end of the quarter immediately preceding the announcement quarter. The premium is defined as $(N_{Q(t)-1} - N_{Q(t)-2}) \times (P_{t+1} - P_{t-1})$, where P_{t+1} is the price of the target stock on the trading day after the announcement. Finally, the markup is defined as $(N_{Q(t)-1} - N_{Q(t)-2}) \times (P_{t+60} - P_{t+1})$, where P_{t+60} is the price of the target stock 60 trading days after the announcement.

[10]To assemble the matching sample, we use the following procedure. We have 7,146 out of 7,184 target firms with non-missing industry codes and market capitalizations. We impute the book value data with any available observations going back up to four quarters from $Q(t) - 4$. This results in 6,589 target firms with available book values (557 targets are with missing book values). Next, we match on the 48 Fama-French

target firms decreases by 36 basis points in the quarter prior to the announcement, it increases by 18 basis points for the matched firms.[11] The decline in mutual fund ownership of target firms is further strengthened if we adjust for the change in mutual fund ownership of peer firms during our sample. This decline can therefore not be explained by changes in ownership triggered by the style characteristics of the target stocks. In contrast, the increase in hedge fund ownership of target firms of 28 basis points in the quarter prior to the announcement is slightly reduced if we adjust for the increase in hedge fund ownership of matched control firms of 8 basis points. Thus, the change in the average hedge fund ownership in target stocks can partially be explained by changes in hedge fund ownership for stocks with similar style characteristics as target stocks.

We also observe that the matched control firms tend to exhibit lower ownership by both mutual funds and hedge funds than the actual target firms in the quarters prior to the merger announcement. We discuss next whether this could be due to the fact that institutional ownership might increase the probability of takeovers.

3.4 Institutional Ownership and Takeover Probability

Hedge funds might purchase stocks with specific characteristics (e.g., small stocks, value stocks, momentum stocks). These stocks, in turn, might also be more likely to become takeover targets, because acquiring companies might consider similar characteristics when selecting potential takeover targets, as discussed by Edmans, Goldstein, and Jiang (2012). Furthermore, hedge funds might not only increase their positions in eventual takeover candidates, they might also increase their positions in similar firms that fail to become takeover

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industry classification and time and make sure that the book-to-market ratios and the market capitalizations of the potential control firms at the end of quarter $Q(t) - 4$ are between 0.5 and 2 times the corresponding values of the target firms. We eliminate self-matches and other firms that become takeover targets in any of the six quarters $Q(t)-4$, $Q(t)-3$, $Q(t)-2$, $Q(t)-1$, $Q(t)$, and $Q(t)+1$. We also require non-missing shares outstanding in four quarters prior to and in the announcement quarter. If there are multiple candidates, we pick the firm with the closest market capitalization to that of the target firm. This process yields 6,259 matches.

[11]The ownership changes differ slightly between Tables 2 and 3 since we do not have valid control firms for all takeover targets. Table 2 is based on 7,184 takeover targets, whereas Table 3 is based on 6,259 takeover targets.

candidates and therefore might experience a decline in their stock prices since the antici-
pated acquisition does not materialize.

To address these concerns, we estimate linear probability specifications modeling the
probability that a company receives a takeover bid using the universe of publicly traded
firms and controlling for firm characteristics.[12] Our tests 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, 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, market-to-book ratio,
and one-year stock return. These controls capture popular quantitative investment strate-
gies based on size, value, and momentum. The standard errors are clustered at the quarter
level and the regressions include time-fixed effects and two-digit SIC fixed effects.

Consistent with our univariate results, the results in Table 4 show that ownership
changes in the quarters prior to the announcement are related to the likelihood of a com-
pany becoming a target. The likelihood decreases if mutual funds raise their ownership and
increases if hedge funds raise their ownership prior to the public announcements.

Controlling for style characteristics of the target firms does not qualitatively affect the
results. In fact, the magnitude of the hedge fund results increase after controlling for
style characteristics. The results also show 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. The coefficients on the control variables indicate that smaller firms and
firms with lower market-to-book ratios are more likely to become takeover targets.

The fact that the effects of institutional ownership on the takeover probability are spread
over several quarters indicates that the ownership changes are not just due to the anticipa-

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[12]Our results from logit regressions are consistent.

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tion of imminent takeovers. Changes in holdings have long-lasting associations with firms that are becoming takeover targets.

3.5 Changes Around Regulation FD

Regulation Fair Disclosure (Reg-FD), passed in 2000, requires that all material information be shared with all investors at the same time. In Table 5, we separate the takeovers according to whether they were announced during 1990-2000 or during 2001-2015. Despite these changes, we find consistent results across the two sub-samples. Mutual funds reduce and hedge funds increase their holdings of takeover targets prior to the announcement during both time periods. The magnitudes of the portfolio changes appear stronger during the more recent time period (2001-2015). However, this result is primarily due to the growth of the holdings for both fund types. Thus, changes in regulation and other changes over our time period do not qualitatively affect institutional trades around merger announcements.

3.6 Univariate Subsamples by Deal Characteristics

We also perform univariate tests for partitions of targets with different deal characteristics.

3.6.1 Target Size

We divide in Panel A of Table 6 the sample based on the market capitalization of the targets four quarters prior to the announcement. The results are broadly consistent across the three subsamples. For all size groups, mutual funds reduce their ownership prior to the M&A announcement, whereas hedge funds increase it. The ownership levels by mutual funds and hedge funds tend to be more substantial for larger targets (in terms of their market capitalizations). For example, four quarters prior to the takeover announcement, mutual funds hold 5.06% of shares outstanding for targets below $100 million and 17.04% for targets above $250 million.

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3.6.2 Target Premium

Panels B and C of Table 6 examine whether funds' purchases are stronger in targets with higher premiums and three-day CARs around the deal announcements. We sort targets based on SDC premiums and three-day CARs around M&A announcements. Overall, we find qualitatively similar results across subsamples. We do not find that hedge fund buying activity is more pronounced for more profitable transactions. Indeed, the increase in hedge fund ownership is stronger for targets that experience lower CARs around announcements. It is possible that hedge fund trading increases the pre-announcement price of to-be targets which, in turn, may lower the price appreciation during the public M&A announcement.

3.6.3 Tender Offers

An interesting finding is that mutual funds substantially reduce their ownership in targets associated with tender offers (by 128 basis points) relatively to non-tender deals (by 15 basis points) in the quarter prior to the announcement, as reported in Panel D. 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 deals. Mutual funds might be less reluctant to sell securities if they cannot anticipate an impending merger announcement.

3.6.4 Multiple Bidders

Panel E of Table 6 separates the sample between transactions with multiple bidders and transactions with single bidders. Slightly less than 10% of target companies attract multiple bidders. While our baseline findings for both mutual funds and hedge funds are unaltered, we observe more pronounced ownership changes in the minority of deals with multiple bidders.

3.6.5 Deal Completion

Our sample includes complete and incomplete (or withdrawn) takeover attempts. We observe results consistent with our main findings across both subsamples, as summarized in

Panel F. Interestingly, the ownership changes are slightly stronger in the subsample of incomplete deals. The increase in ownership by hedge funds in the subset of withdrawn deals is notable given that Malmendier, Opp, and Saidi (2016) find that many targets in withdrawn deals experience a permanent revaluation of 15% for all cash targets.

In general, the subsample results in Table 6 corroborate our main findings: prior to M&A announcements, mutual funds tend to decrease and hedge funds tend to increase their ownership in takeover candidates across different time periods and for deals with different characteristics.

3.7 Dynamic Ownership Changes

We can only observe institutional ownership at a quarterly frequency. This prevents us from studying trades during a shorter window around takeover announcements. In this subsection, we indirectly infer the higher-frequency trading of institutional investors by evaluating ownership changes for deals announced at different times during a quarter and by taking advantage of daily fund returns.

3.7.1 Timing of Announcements

Table 7 divides our sample of deals based on the timing of the M&A announcement during the event quarter. Such timing is informative because it helps us to understand the timing of trades within a quarter. For example, if a merger announcement takes place at the beginning of quarter $Q(t)$, then the holdings at the end of quarter $Q(t)-1$ 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 $Q(t)-1$ are less likely to incorporate a takeover announcement that occurs at the end of quarter $Q(t)$. Of the 7,184 deals, 1,479 are announced within the first 20 calendar days of the quarter, 4,073 are announced in the middle of the quarter, and the remaining 1,632 deals become public within the last 20 calendar days of the announcement quarter.

The estimates in Table 7 show stronger ownership changes in the quarter prior to the

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M&A announcement by funds for transactions announced at the beginning of the event quarter. This evidence indicates that trading by mutual funds and hedge funds in takeover targets accelerates immediately prior to the M&A announcement. Thus, the trades in quarter $Q(t) - 1$ prior to the announcement (reported in Table 2) likely understate the overall trading activity prior to the M&A announcement because additional trading occurs just before the announcement during quarter $Q(t)$.

3.7.2 Daily Fund Returns

An alternative way to infer the timing of trades is to compare the daily returns of mutual funds on the announcement dates with the returns of the holdings of the mutual funds including and excluding the target stock holdings. The actual fund return will correspond more closely to the holdings return *including* the target stock if the mutual fund continues to hold the target stock on the announcement day. On the other hand, the actual fund return will correspond more closely to the holdings return *excluding* the target stock if the mutual fund sells the target stock prior to the announcement.

Conditional on the mutual fund owning of a target at the end of quarter $Q(t) - 1$, we compare the actual (reported) fund return with the holdings-based-return including and excluding the target's stock over a three day window around the M&A announcement.[13] We focus in this subsection on the sample of domestic equity mutual funds, as summarized in Panel B of Table 1 and described in Section 2.

The results are reported in Panel A of Table 8. Mutual funds holding target stocks at the end of the prior quarter generate an actual return of 21.1 basis points during a three-

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[13]The holdings-based return is calculated as the value-weighted average three-day return across various asset classes of the portfolio composition. For each fund at $Q(t) - 1$, we obtain the percent of a portfolio allocated to equities, cash, and bonds/preferred stocks from the CRSP fund summary file. The return on the equity part of the portfolio is based on the mutual fund holdings at $Q(t) - 1$ and is obtained by multiplying the stock weight by the corresponding three-day stock return around the deal announcement date, and summing these products at the portfolio level. We proxy for the cash and bond/preferred stock returns using published indices. For bonds and preferred stocks, we use the total return of the Bloomberg Barclays US Aggregate Bond Index, while for cash holdings we use the one-month Treasury bill rate. We adjust the holdings-based returns for the three-day expense ratio, obtained by dividing the annual fund expense ratio into 250 and multiplying by 3. The weights of the equity positions are rebalanced for the portfolio that excludes the target stock.

day window around the announcement of the M&A transaction. In addition, the average three-day return based on the previously-disclosed holdings amounts to 24.3 basis points including the target stock and 16.5 basis points excluding the target stock. The difference between the holdings returns including and excluding the target stock of 7.8 basis points is due to the announcement effect of the target stock.

We also compare the actual fund returns with the holdings returns for our sample of control firms. We consider mutual funds that invest in the control firms at the end of the quarter prior to the acquisition announcements. This comparison with control funds is important since the reported fund return might be systematically different from the holdings return due to unobserved trading costs or interim trading benefits, as discussed by Kacperczyk, Sialm, and Zheng (2008). We find that the funds holding the control firm exhibit a return of 14.5 basis points over the three-days around the announcement. The difference in the holdings returns including and excluding the control firm of 0.1 basis points is much smaller than the corresponding difference of 7.8 basis points for the funds holding the target stock. Interestingly, the small return difference of 0.1 basis points is statistically significant, indicating that matched firms also appreciate slightly on the announcement day. For the control funds, the reported fund return underperforms the holdings return including the target by 2.1 basis points, indicating that trading costs exceed interim trading benefits.

In Panel B of Table 8, we explore the announcement effects in a regression framework. We regress the three-day reported fund return in excess of the holdings return including the target firm around the announcement day on the announcement effect and on the holdings return including the target. The announcement effect is defined as the product of a fund's allocated portfolio weight to the target firm at the end of $Q(t)-1$ and the target's three-day return around the M&A announcement day. The holdings-based return including the target is defined as the return of a fund holding the disclosed fund positions at the end of the prior quarter, $Q(t) - 1$.

The coefficient on the announcement effect estimates the proportion of the target stock that is sold prior to the M&A announcement. If all funds completely sell their holdings

of the target stock before the announcement, then the coefficient on the announcement effect will be −1. However, if all funds continue to hold the target until after the M&A announcement, then the coefficient on the announcement effect will be equal to zero.

The results in Panel B of Table 8 indicate that around one-third of mutual fund holdings in the target are, on average, liquidated prior to the M&A announcement. Thus, the liquidation behavior of mutual funds actually accelerates during the announcement quarter. We repeat this analysis on the control firms and find that the results are in contrast to those for target firms in that the coefficient on the announcement effect for the control firms is insignificantly positive.

Our findings suggest that mutual funds are generally uninformed about forthcoming M&A announcements. For hedge funds, possible drivers of their accumulation of the targets' stock prior to the M&A announcements could be related to the possession of private information, or superior 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. Our results provide a striking contrast between mutual funds and hedge funds with respect to their trading behavior in to-be M&A targets.

3.8   Short Selling Activities

Institutional investors are only required to disclose their long positions in their 13F filings. This restriction is particularly important for hedge funds, who frequently participate in short selling. Ignoring short positions might result in misleading inferences if the long positions by some investors are offset by the short positions by other investors of the same type.

We examine short selling activity in targets and bidders prior to M&A announcements using data from COMPUSTAT following Rapach, Ringgenberg, and Zhou (2016). The aggregate amount of short selling is reported monthly in the middle of each calendar month. For deals announced in the first half of a month (that is, before the short interest report),

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we treat the short interest report one month prior to the M&A announcement month as a report in month $M(t) - 1$. For deals announced after the short interest report is announced, we treat the short interest report in the M&A announcement month as a report in month $M(t) - 1$. We normalize the short selling by the number of shares outstanding on the corresponding dates.

Although we do not know the identity of the short-sellers, it is likely that a substantial fraction of short selling derives from hedge funds. Retail investors, and to a lesser extent, mutual funds might also contribute to the short selling.

Table 9 reports the aggregate proportion of short positions as a proportion of shares outstanding for targets and bidders. We do not find a significant increase in the proportion of short selling in the target during the month prior to the public M&A announcement. The increase in short selling in the target stock is slightly larger, but still insignificant, if we consider a longer window. Since we do not uncover a decline in short selling prior to the announcement, short sellers in the aggregate do not appear to be anticipating the M&A announcement. The change in short selling before the M&A announcements is substantially smaller than the change in the long positions of hedge funds over the same time period. Thus, even if we attribute all the changes in short selling to hedge funds, we would still observe an increase in net holdings of target companies by hedge funds in the months prior to the announcement. We also find a slight increase in the short selling of the bidder companies over several months prior to the announcement.

The changes in short selling in targets and bidders after the M&A announcement are more pronounced than the changes prior to the announcement. We observe a decline in short selling in target firms from 3.98% to 3.45% in the month of the takeover announcement. Furthermore, we also find an increase in short selling in bidder firms from 3.28% to 3.75% in the month of the takeover announcement. This increase in short selling for acquirers could be due to the activities of merger arbitrageurs who go long the stock of the target and go short the stock of the acquiring company immediately after the acquisition announcement.

3.9 Mutual Fund Affiliation with M&A Advisors

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.

Growing evidence suggests that financial conglomerates may exploit their access to private information in various ways. Bodnaruk, Massa, and Simonov (2009), for example, 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. 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 1,926 funds in our sample, 1,901 have information about the identity of their affiliated management company. The target M&A advisor's identity is available for 6,527 (out of 7,184) deals, and the acquirer M&A advisor's name is available for about 67% of our sample offers (4,854 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.

Table 10 reports the ownership of the target company by mutual funds whose management company advises M&A targets or acquirers. The funds affiliated with M&A *target advisors* do not exhibit an increase in their ownership in the quarter immediately preceding the merger announcement. However, over the three quarters prior to the merger announcement, their ownership in affiliated takeover targets increases by about 1.6 basis points. This longer-term increase in ownership of target firms by affiliated advisors is not necessarily due to trading based on private information. It could also occur because financial firms with

increasing mutual fund ownership stakes might be more likely to be selected as advisors by potential takeover targets.

In contrast, the ownership in the target firm by funds that are affiliated with M&A *bidder advisors* declines by about 1.4 basis points during the three quarters prior to the deal announcement quarter. An indication that ownership changes are not driven by short-term information about an upcoming takeover is provided by the fact that fund ownership in an impending target does not change significantly in the quarter immediately prior to the M&A announcement. This finding is consistent with those reported for all mutual funds in our sample, as reported in Table 2.

3.10 Hedge Fund Activism

A number of studies provide evidence that hedge fund managers are able to influence corporate management and act as informed monitors. For example, Brav, Jiang, Partnoy, and Thomas (2008) find a relatively large average abnormal return for a firm subject to activism of about 7% over the period beginning 20 days prior to the filing of a Schedule 13D to 20 days after. Brav, Jiang, Partnoy, and Thomas (2008) document improvements in the affected 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 firms subject to activism. and Wu and Chung (2019) also show that hedge fund activism increases shareholder wealth by forcing corporate M&A to be more efficient and disciplined. In contrast, Greenwood and Schor (2009) argue that most of the activism announcement returns are explained by activists' ability to force activism firms into a takeover. Greenwood and Schor (2009) suggest that activists pursue certain firms because they anticipate that those companies will soon be acquired. Gantchev and Jotikasthira (2018) show that institutional sales raise a firm's probability of becoming subject to activism 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 may have access to information that other market participants do not.

We explore this plausible channel between hedge funds and their holdings in activism firms that become takeover targets. The expanded sample from Brav, Jiang, Partnoy, and Thomas (2008) includes 4,058 activism-firm observations over the period 1994-2014 for the sample of 663 unique hedge funds.[14] 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 firms are held by these 114 activists. Out of 548 firms subject to activism, 76 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. The first column of Table 11 reports the ownership for the identified activists holding shares of all M&A target firms in our sample regardless of whether these firms are subject to activism. Consistent with our baseline results for hedge funds reported in Table 2, activists increase their ownership in M&A targets from 0.048% to 0.090% of shares outstanding over the three quarters prior to deal announcements. The ownership levels by activist hedge funds is very small since they only account for a small fraction of hedge fund investors.

The second column reports hedge fund ownership for transactions excluding the activist hedge funds. The findings in this subsample are consistent with the baseline results for all hedge funds: the ownership by non-activist hedge funds also increases significantly in the quarters prior to the M&A announcement. Thus, our baseline hedge fund results are not primarily driven by this sample of activist hedge fund investors.

The third column of Table 11 includes hedge fund activist ownership in the 76 activism

firms that are also M&A targets held by funds who file a Schedule 13D within one year before the merger announcement date. We observe a very significant increase in their holdings from 6.59% to 11.57% during the three quarters before the M&A announcement. Thus, activist hedge funds contribute to a significant increase in ownership in a relatively small sample of firms targeted by activism.

The fourth column reports the percentage ownership in the 76 activism firms that are also acquisition targets by non-activist hedge funds. Holdings in these firms by non-activist hedge funds is fairly high and also increases gradually over time. Thus, non-activist hedge funds might cooperate explicitly and implicitly with activist hedge funds in increasing ownership in firms targeted by hedge fund activism, as also discussed by Brav, Dasgupta, and Mathews (2018), Kedia, Starks, and Wang (2016), and Apple, Gormley, and Keim (2018). The last column reports the aggregate ownership by all hedge funds in the 76 activism firms. In the small subset of firms that are both subject to activism and an M&A bid, the increasing trend in hedge fund ownership prior to deal announcements is primarily driven by activists' trading.

The evidence in Table 11 shows that hedge fund activism is one of several possible channels for value creation vis-a-vis their accumulation of ownership in eventual takeover targets.

4   Cross-Sectional Evidence

In this section we study whether there are systematic differences in trading across mutual funds around takeover announcements. Consequently, we transition in this section to fund-level analyses. We focus in this section on the sample of domestic equity mutual funds, as summarized in Panel B of Table 1.

4.1 Persistence

We explore whether this tendency of allocating higher (lower) portfolio weights to target firms by mutual funds or hedge funds is persistent over time. If institutional investors have an ability to identify takeover targets, then we should observe that they persistently overweigh these companies. On the other hand, if they are just lucky to once hold a high stake in a takeover target, then we should not observe that the same institutions will continue to overweigh takeover targets in subsequent periods. To evaluate this, 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. The first group corresponds to the funds that do not hold at the end of quarter $Q(t) - 1$ any companies that become takeover targets in the subsequent quarter $Q(t)$. The remaining three groups correspond to terciles based on the weights invested at the end of quarter $Q(t) - 1$ in companies that become takeover targets in the subsequent quarter. We then examine the portfolio weights allocated to future target firms in the following four quarters. Every quarter we average the proportional holdings in takeover companies across the funds within each group. In a second step, we take the time-series average of the cross-sectional averages.

Panel A of Table 12 reports the average weights allocated to takeover targets by mutual funds in the four groups formed at the end of quarter $Q(t) - 1$. In the formation period, the lowest tercile with positive holdings exhibits a weight of 0.45%, whereas the highest tercile exhibits a weight of 3.33% in to-be targets. Although we observe a mean reversion in ownership weights, we detect significant persistence in the weights invested in takeover targets across time. For example, mutual funds that do not own any takeover targets in the prior quarter will only invest 0.49% of their portfolios in new takeover candidates in the next quarter. In contrast, funds in the highest tercile of target ownership in the prior quarter will invest 0.74% of their portfolios in new takeover targets in the subsequent quarter. We compute the differences in average weights for the highest and lowest terciles, and report Newey-West-adjusted t-statistics with a lag length of five quarters. 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 12. Similar to the outcomes for the mutual fund sample, we observe significant persistence in portfolio weights in takeover targets allocated by hedge funds over an extended time period. For example, hedge funds that do not own any takeover targets in the prior quarter will only invest 1.21% of their portfolios in new takeover candidates in the next quarter, whereas funds in the highest tercile will invest 2.02% of their portfolios in new takeover targets in the subsequent quarter.

These results demonstrate that propensity to hold impending takeover targets is a persistent feature of their investment strategies of mutual funds and hedge funds and not simply the result of lucky draws.

4.2 Fund Activeness

The activeness of mutual funds has been associated with positive investment ability (e.g., Kacperczyk, Sialm, and Zheng (2008), Cremers and Petajisto (2009), Amihud and Goyenko (2013)). Funds need to deviate from their benchmarks to be able to outperform these benchmarks. In this section, we explore whether trading in takeover targets depends on the activeness of mutual fund managers.

We consider several measures of mutual fund activeness. First, we use the Active Share measure proposed by Cremers and Petajisto (2009). Active Share is computed as the share of portfolio positions that differ from the benchmark index holdings. We follow the methodology of Amihud and Goyenko (2013) and construct the second measure of stock-selectivity, Fund $(1 - R^2)$. The R^2 comes from four-factor regressions using the previous 36 monthly return observations. Since a lower R^2 is indicative of greater investment ability, we subtract its value from one for easier comparability with the other activeness measures. Our third 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.

For each target, we merge all funds in the sample that exist at the time of the deal announcement. We repeat this procedure with the control firms, and integrate the two datasets. The unit of observation is at the fund-firm level, where firm refers to either a target company or its corresponding control firm. The control group is obtained from the procedure described in Table 3. The $Target\ firm$ indicator variable equals one if a firm is a takeover target, and is zero if a firm is a corresponding control group company. The dependent variable is a fund's difference in $log(1 + shares_{Q(t)-1})$ and $log(1 + shares_{Q(t)-2})$, given that $Q(t)$ is the announcement quarter. If a fund does not hold a potential target (or a firm from the control group), its number of adjusted shares is zero. The independent variable of interest is the interaction term between activeness measures and a target firm dummy. Other independent variables include fund and firm characteristics.

Table 13 reports the results. We find a strong positive relation between the change in fund ownership in takeover targets prior to M&A announcements and the three measures of fund activeness. Consistent with the base-case specification in Table 2, we find that the holdings of impending target firms decrease in the quarter prior to the announcement. This decline is significantly less pronounced for funds that exhibit a higher level of activeness. This evidence suggests that more active mutual funds do not decrease their stake in to-be targets as much as other mutual funds do. The cross-sectional differences in holdings adjustments of target firms are also economically substantial. For example, a mutual fund with a mean level of Active Share (i.e., 0.814 according to Table 1B) tends to reduce positions in to-be target stocks by around 0.88 basis points in the quarter before the M&A announcement (i.e., $(0.247 \times 0.814 - 0.289)/1000 = -0.88bp$). In contrast a fund with a one-standard deviation higher active share than the mean fund tends to reduce positions in to-be target stocks by only 0.48 basis points prior to the announcement (i.e., $(0.247 \times (0.814+0.160)-0.289)/1000 = -0.48bp$).[15] Even though the mutual fund sector, as a whole,

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[15]The average decrease in target stocks for an average fund is small because few individual mutual funds actually hold the target stock in the quarter prior to the announcement. Furthermore, the difference $log(1 + shares_{Q(t)-1}) - log(1 + shares_{Q(t)-2})$ does not exactly correspond to the log-change in number of shares since we add one to the number of shares. However, the difference corresponds closely to the log-change if a fund holds a significant number of shares in both periods.

significantly decreases their holdings in targets prior to deal announcement, more actively-managed funds appear to be either better informed or more skillful to predict takeover targets than more passively-managed funds.

These results show that less active funds are most likely to sell impending target candidates prior to the public announcement of an M&A transactions. Consistent with the prior literature, we find that the mutual funds exhibiting high activeness are more skilled and its trading strategies around merger announcements correspond more closely to the strategies of hedge funds.

5   Conclusion

We analyze the holdings of institutional investors around takeover announcements to better understand the investment strategies of institutions facing different regulatory environments, compensation policies, and investment restrictions. 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 M&A deals. In contrast, either due to better information about an impending merger or superior ability in identifying takeover targets, hedge funds are more likely than mutual funds to benefit from their ownership in target firms during M&A transactions.

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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.
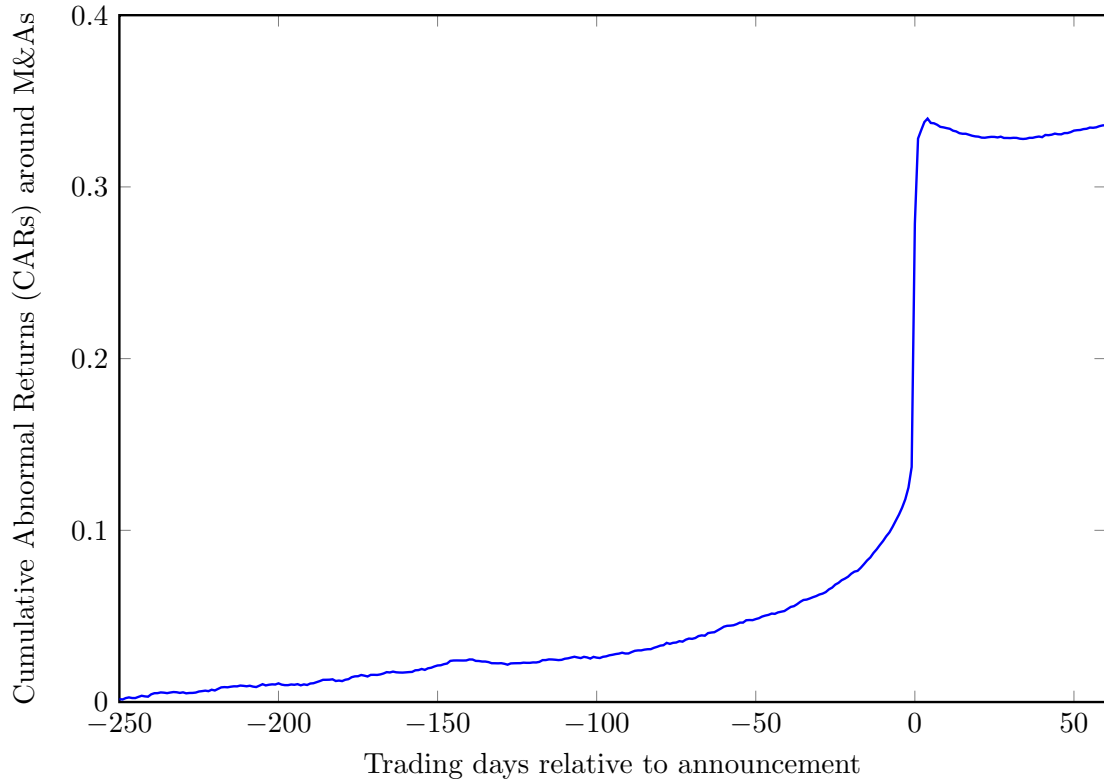
Figure 2: Mutual and hedge fund ownership in takeover targets

These figures illustrate the evolution of the mutual and hedge fund ownership in acqui-
sition targets around M&A 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. Panel A displays the average
ownership by mutual funds (hedge funds) across all deals. Panel B displays the difference in
average ownership between the target firm and the matched control firm by mutual funds
(hedge funds) across all deals with valid matches.

Panel A: Aggregate Ownership of Target Firms
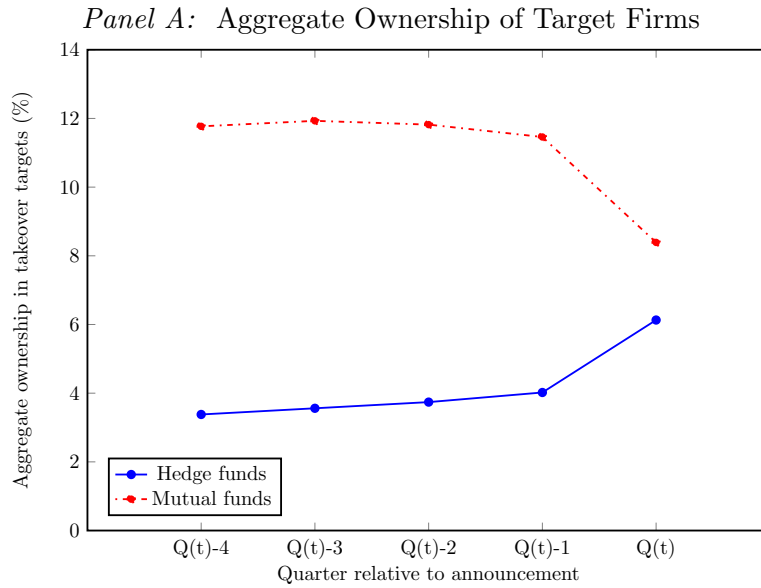
Panel B: Difference in Aggregate Ownership Between Target and Control Firms

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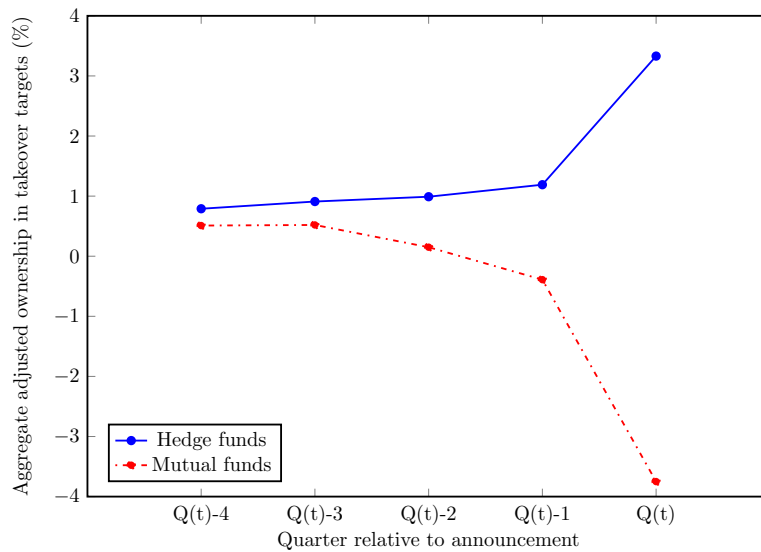
Table 1: Summary statistics

Panel A of this table reports the summary statistics of 7,184 deal characteristics. The sample runs from January 1990 to December 2015. The target stock characteristics are measured as of the quarter-end prior to the deal announcement quarter. Panel B of this table reports the descriptive statistics of 1,926 mutual funds in our sample. These statistics are calculated from 70,200 mutual-fund-quarter observations. Panel C shows the summary statistics of 1,162 hedge funds based on 31,089 hedge-fund-quarter observations. Hedge fund age is calculated based on the date of the first 13F report. All continuous variables are winsorized at the 1% level.

Panel A : Firm, deal, and ownership characteristics summary statistics

	Mean	Median	Std Dev	5th percentile	95th percentile
Complete	0.821	1.000	0.383	0.000	1.000
All cash	0.424	0.000	0.494	0.000	1.000
All stock	0.266	0.000	0.441	0.000	1.000
Competing	0.096	0.000	0.294	0.000	1.000
Diversifying	0.681	0.000	0.465	0.000	1.000
Tender	0.187	0.000	0.389	0.000	1.000
Hostile	0.093	0.000	0.290	0.000	1.000
SDC premium	0.407	0.333	0.656	-0.058	1.069
Target CAR3	0.205	0.165	0.221	-0.059	0.615
Target market capitalization (mil$)	1,420	231	4,994	33	5,776
Target market-to-book	2.408	1.617	3.816	0.272	7.649
Mutual fund ownership in a target (%)	11.464	8.028	11.248	0.000	35.168
Hedge fund ownership in a target (%)	4.018	1.023	6.421	0.000	18.502
One-year target's stock return	0.093	0.039	0.491	-0.699	1.044
%Shares of target's stock held short	3.980	2.189	5.504	0.028	14.217
%Shares of bidder's stock held short	3.282	1.841	4.228	0.058	11.271

Panel B : Mutual fund summary statistics

	Mean	Median	Std Dev	5th percentile	95th percentile
TNA (mil$)	1,994	437	5,378	31.4	8,567
Age (years)	19	16	15	5	52
Expense ratio (%)	1.218	1.181	0.396	0.650	1.952
Turnover ratio (%)	0.802	0.620	0.683	0.100	2.160
1Q fund return (%)	2.222	2.676	10.294	-16.305	17.314
Flows (%)	2.287	-1.649	12.054	-12.142	18.005
Active Share	0.814	0.861	0.160	0.518	0.987
Fund $(1 - R^2)$	0.133	0.091	0.132	0.019	0.420
| *Return Gap* | (%)	0.260	0.148	0.338	0.017	0.906

Panel C : Hedge fund summary statistics

	Mean	Median	Std Dev	5th percentile	95th percentile
Number of stocks held	93	35	218	5	378
$Value of reported equities (mil$)	885	229	2,514	15.848	3,510
Age (years)	6	5	6	1	19

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

Panel A of this table reports the average mutual fund and hedge fund ownership (in %) and changes in ownership in takeover targets around M&A announcements. 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. Panel B reports the average number of mutual funds and hedge funds that hold a takeover firm. If none of mutual (hedge) funds in our sample hold a target firm, this number, as well as the percent ownership, is set to 0. Standard errors are clustered at the quarter level. The t-statistics are shown in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A : Percent ownership in target firms

	Number of deals	Mutual funds	Hedge funds
$Q(t) - 4$	7,184	11.77	3.38
$Q(t) - 3$	7,184	11.93	3.56
$Q(t) - 2$	7,184	11.82	3.74
$Q(t) - 1$	7,184	11.46	4.02
$Q(t)$	6,935	8.39	6.13
$[Q(t) - 1] - [Q(t) - 2]$	7,184	-0.36**	0.27***
		(-2.25)	(6.12)
$[Q(t) - 1] - [Q(t) - 3]$	7,184	-0.47***	0.46***
		(-3.15)	(7.01)
$[Q(t) - 1] - [Q(t) - 4]$	7,184	-0.31	0.63***
		(-1.24)	(7.83)
$[Q(t)] - [Q(t) - 1]$	6,935	-3.12***	2.13***
		(-11.20)	(14.00)

Panel B : Number of funds that hold target firms

	Number of deals	Mutual funds	Hedge funds
$Q(t) - 4$	7,184	64.28	4.79
$Q(t) - 3$	7,184	63.73	4.91
$Q(t) - 2$	7,184	64.39	5.11
$Q(t) - 1$	7,184	62.43	5.47
$Q(t)$	6,935	48.50	8.38
$[Q(t) - 1] - [Q(t - 2)]$	7,184	-1.96**	0.36***
		(-2.24)	(5.23)
$[Q(t) - 1] - [Q(t - 3)]$	7,184	-1.30	0.56***
		(-1.43)	(6.00)
$[Q(t) - 1] - [Q(t - 4)]$	7,184	-1.85	0.68***
		(-1.04)	(6.29)
$[Q(t)] - [Q(t) - 1]$	6,935	-13.93***	2.91***
		(-8.10)	(14.19)

Table 3: Mutual fund and hedge fund ownership in takeover targets and control group firms

This table reports the average mutual fund and hedge fund ownership (in %) and changes in ownership in takeover targets and control group firms around M&A announcements. 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. We match our sample of targets based on the Fama-French 48 industry classification and time, and obtain all firms with book-to-market and market capitalization between 0.5x and 2x of that of the target firm at $Q(t) - 4$. We also eliminate self-matches and other companies that become takeover targets in any of the six quarters $Q(t) - 4$, $Q(t) - 3$, $Q(t) - 2$, $Q(t) - 1$, $Q(t)$, and $Q(t) + 1$. We require non-missing total shares outstanding in four quarters prior to and in the announcement quarter. If there are multiple candidates, we pick the firm with the closest market capitalization to that of the target firm. This results in 6,259 matches. Standard errors are clustered at the quarter level. The t-statistics are shown in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Mutual funds			Hedge funds		
	Treatment group (1)	Control group (2)	Difference (1)-(2)	Treatment group (3)	Control group (4)	Difference (3)-(4)
$Q(t) - 4$	12.10	11.59	0.51**	3.59	2.80	0.79***
			(2.48)			(8.08)
$Q(t) - 3$	12.24	11.72	0.52**	3.77	2.86	0.91***
			(2.50)			(9.01)
$Q(t) - 2$	12.14	11.99	0.15	3.97	2.98	0.99***
			(0.72)			(9.53)
$Q(t) - 1$	11.78	12.17	-0.39*	4.25	3.06	1.19***
			(-1.88)			(11.13)
$Q(t)$	8.57	12.32	-3.75***	6.55	3.22	3.33***
			(-19.66)			(26.66)
$[Q(t) - 1] - [Q(t) - 2]$	-0.36**	0.18*	-0.54***	0.28***	0.08***	0.20***
	(-2.22)	(1.74)	(-5.73)	(5.74)	(2.69)	(5.16)
$[Q(t) - 1 - Q(t) - 3]$	-0.46***	0.45***	-0.91***	0.48***	0.20***	0.28***
	(-3.02)	(3.10)	(-10.85)	(7.07)	(4.82)	(5.46)
$[Q(t) - 1] - [Q(t) - 4]$	-0.32	0.58***	-0.90***	0.66***	0.26***	0.40***
	(-1.22)	(2.46)	(-8.35)	(7.69)	(5.08)	(6.50)
$[Q(t)] - [Q(t) - 1]$	-3.25***	0.15	-3.40***	2.30***	0.16***	2.14***
	(-11.23)	(0.67)	(-31.29)	(14.06)	(4.34)	(29.28)

Table 4: Linear probability model of takeover decisions

This table reports the linear probability 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 linear probability model 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 the natural logarithm of market capitalization, the market-to-book ratio, and the one-year return. All continuous variables are winsorized at the 1% level. Standard errors are clustered at the quarter 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)$_{t-2\to t-1}$	-0.031***	-0.031***			-0.032***
	(-5.80)	(-5.01)			(-5.26)
Δ(MF ownership/TSO)$_{t-3\to t-2}$	-0.030***	-0.029***			-0.032***
	(-6.89)	(-5.32)			(-5.93)
Δ(MF ownership/TSO)$_{t-4\to t-3}$	-0.004	0.002			-0.001
	(-1.18)	(0.43)			(-0.30)
Δ(HF ownership/TSO)$_{t-2\to t-1}$			0.044***	0.096***	0.092***
			(3.80)	(6.16)	(5.87)
Δ(HF ownership/TSO)$_{t-3\to t-2}$			0.033***	0.087***	0.085***
			(2.83)	(6.06)	(5.90)
Δ(HF ownership/TSO)$_{t-4\to t-3}$			0.042***	0.117***	0.117***
			(3.59)	(7.15)	(7.16)
(MF ownership/TSO)$_{t-4}$		0.010***			0.006***
		(5.09)			(3.19)
(HF ownership/TSO)$_{t-4}$				0.119***	0.118***
				(17.28)	(17.21)
Log(mkt cap)$_{t-1}$		-0.001***		-0.001***	-0.001***
		(-9.67)		(-7.98)	(-9.17)
Market-to-book$_{t-1}$		-0.0001**		-0.0001***	-0.0001***
		(-2.33)		(-3.10)	(-2.84)
1-year stock return$_{t-1}$		-0.0003		-0.001***	-0.0007*
		(-0.90)		(-3.14)	(-1.91)
Intercept	0.001	0.024***	-0.001***	0.012***	0.015***
	(0.89)	(8.73)	(-0.99)	(4.40)	(5.52)
Time (quarter) and 2-digit SIC fixed effects	Yes	Yes	Yes	Yes	Yes
N	651,424	435,588	651,424	435,588	435,588

Table 5: Mutual fund and hedge fund ownership in takeover targets by subperiods

This table reports mutual fund and hedge fund ownership in target firms during the period of 1990-2000 (before Regulation Fair Disclosure) and during the period of 2001-2015 (after this regulatory change). 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. Standard errors are clustered at the quarter level. The t-statistics are shown in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| | Deals announced 1990-2000 (N=3,668) | | Deals announced 2001-2015 (N=3,516) | |
	Mutual funds	Hedge funds	Mutual funds	Hedge funds
$Q(t) - 4$	7.22	1.33	16.52	5.52
$Q(t) - 3$	7.34	1.45	16.72	6.76
$Q(t) - 2$	7.28	1.52	16.57	6.07
$Q(t) - 1$	7.00	1.65	16.12	6.49
$Q(t)$	5.40	2.79	11.47	9.56
$[Q(t) - 1] - [Q(t) - 2]$	-0.28	0.13***	-0.45**	0.42***
	(-1.18)	(3.28)	(-1.99)	(5.83)
$[Q(t) - 1] - [Q(t) - 3]$	-0.34**	0.20***	-0.60**	0.27***
	(-1.99)	(3.64)	(-2.43)	(7.15)
$[Q(t) - 1] - [Q(t) - 4]$	-0.22	0.32***	-0.40	0.97***
	(-0.57)	(5.61)	(-1.32)	(7.31)
$[Q(t)] - [Q(t) - 1]$	-1.58***	1.14***	-4.71***	3.07***
	(-4.70)	(9.24)	(-15.61)	(17.67)

Table 6: Mutual fund and hedge fund ownership in takeover targets by subsamples

This table reports mutual fund and hedge fund ownership associated with the target firms sorted on the basis of market capitalization, SDC premium, CAR, tender, multiple bidders, and complete status. This table reports the average mutual fund and hedge fund ownership (in %) and changes in ownership in takeover targets around M&A announcements. 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. Standard errors are clustered at the quarter level. The t-statistics are shown in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A : Split by target's market capitalization

	[$25M; $100M) (N=2,099)		[$100M; $250M) (N=1,584)		≥$250M (N=3,501)	
	Mutual funds	Hedge funds	Mutual funds	Hedge funds	Mutual funds	Hedge funds
$Q(t)-4$	5.06	2.45	9.00	3.62	17.04	3.92
$Q(t)-3$	4.98	2.54	9.04	3.85	17.41	4.12
$Q(t)-2$	4.72	2.65	8.87	4.02	17.42	4.35
$Q(t)-1$	4.36	2.81	8.52	4.23	17.05	4.67
$Q(t)$	3.27	3.65	6.21	5.61	12.40	7.88
$[Q(t)-1]-[Q(t)-2]$	-0.36***	0.16***	-0.35***	0.21***	-0.37*	0.35***
	(-2.73)	(3.15)	(-2.65)	(3.94)	(-1.81)	(4.79)
$[Q(t)-1]-[Q(t)-3]$	-0.62***	0.27***	-0.52***	0.38***	-0.36	0.55***
	(-4.80)	(4.00)	(-3.30)	(5.27)	(-1.62)	(5.39)
$[Q(t)-1]-[Q(t)-4]$	-0.70***	0.36***	-0.48*	0.61***	0.01	0.75***
	(-3.02)	(4.87)	(-1.92)	(6.41)	(0.02)	(5.58)
$[Q(t)]-[Q(t)-1]$	-1.04***	0.84***	-2.37***	1.38***	-4.69***	3.21***
	(-6.50)	(7.22)	(-10.39)	(9.34)	(-11.65)	(15.41)

Panel B : Split by SDC premium (available for 6,709 deals)

	Deals with premium above the median (N=3,354)		Deals with premium below the median (N=3,355)	
	Mutual funds	Hedge funds	Mutual funds	Hedge funds
$Q(t)-4$	11.35	3.31	12.80	3.45
$Q(t)-3$	11.58	3.46	12.85	3.64
$Q(t)-2$	11.51	3.62	12.76	3.85
$Q(t)-1$	11.04	3.87	12.46	4.15
$Q(t)$	7.74	6.38	9.41	5.91
$[Q(t)-1]-[Q(t)-2]$	-0.47***	0.25***	-0.30*	0.30***
	(-2.50)	(5.00)	(-1.71)	(5.03)
$[Q(t)-1]-[Q(t)-3]$	-0.54***	0.41***	-0.39**	0.51***
	(-3.28)	(5.81)	(-2.49)	(6.16)
$[Q(t)-1]-[Q(t)-4]$	-0.31	0.56***	-0.34	0.70***
	(-1.19)	(6.65)	(-1.26)	(6.84)
$[Q(t)]-[Q(t)-2]$	-3.33***	2.51***	-3.09***	1.76***
	(-11.25)	(14.10)	(-10.07)	(10.92)

Continued on next page

Table 6 – *Continued*

Panel C : Split by targets' CARs

	Deals with CARs above the median (N=3,551)		Deals with CARs below the median (N=3,551)	
	Mutual funds	Hedge funds	Mutual funds	Hedge funds
$Q(t) - 4$	12.50	3.75	11.08	3.04
$Q(t) - 3$	12.81	3.92	11.11	3.22
$Q(t) - 2$	12.65	4.09	11.06	3.42
$Q(t) - 1$	12.21	4.22	10.76	3.83
$Q(t)$	8.41	6.94	8.37	5.38
$[Q(t) - 1] - [Q(t) - 2]$	-0.44***	0.13***	-0.30*	0.41***
	(-2.48)	(2.75)	(-1.72)	(6.70)
$[Q(t) - 1] - [Q(t) - 3]$	-0.60***	0.30***	-0.35***	0.61***
	(-3.39)	(4.55)	(-2.40)	(7.30)
$[Q(t) - 1] - [Q(t) - 4]$	-0.29	0.47***	-0.32	0.79***
	(-1.14)	(5.91)	(-1.21)	(7.36)
$[Q(t)] - [Q(t) - 1]$	-3.86***	2.72***	-2.44***	1.55***
	(-12.51)	(14.52)	(-8.99)	(11.08)

Panel D : Split by tender offers

	Tender offers (N=1,343)		Non-tender offers (N=5,841)	
	Mutual funds	Hedge funds	Mutual funds	Hedge funds
$Q(t) - 4$	13.25	4.02	11.43	3.24
$Q(t) - 3$	13.25	4.10	11.63	3.43
$Q(t) - 2$	13.30	4.30	11.49	3.62
$Q(t) - 1$	12.01	4.54	11.34	3.89
$Q(t)$	6.86	6.35	8.70	6.08
$[Q(t) - 1] - [Q(t) - 2]$	-1.28***	0.24***	-0.15	0.27***
	(-4.09)	(2.76)	(-1.11)	(6.30)
$[Q(t) - 1] - [Q(t) - 3]$	-1.24***	0.44***	-0.29**	0.46***
	(-5.33)	(4.09)	(-2.05)	(7.23)
$[Q(t) - 1] - [Q(t) - 4]$	-1.24***	0.52***	-0.09	0.65***
	(-3.51)	(3.70)	(-0.39)	(8.34)
$[Q(t)] - [Q(t) - 1]$	-5.36***	1.81***	-2.66***	2.19***
	(-11.60)	(7.18)	(-9.87)	(13.94)

Continued on next page

Table 6 – *Continued*

Panel E : Single vs. multiple bidders

	Multiple bidders (N=690)		Single bidders (N=6,494)	
	Mutual funds	Hedge funds	Mutual funds	Hedge funds
$Q(t) - 4$	13.54	3.95	11.58	3.32
$Q(t) - 3$	13.49	4.26	11.76	3.48
$Q(t) - 2$	13.34	4.69	11.66	3.64
$Q(t) - 1$	12.09	5.70	11.39	3.84
$Q(t)$	9.33	8.55	8.29	5.87
$[Q(t) - 1] - [Q(t) - 2]$	-1.25***	1.01***	-0.27*	0.20***
	(-4.42)	(5.45)	(-1.68)	(5.03)
$[Q(t) - 1] - [Q(t) - 3]$	-1.40***	1.44***	-0.37***	0.36***
	(-4.26)	(6.74)	(-2.62)	(5.82)
$[Q(t) - 1] - [Q(t) - 4]$	-1.45***	1.75***	-0.19	0.52***
	(-3.42)	(7.13)	(-0.76)	(6.63)
$[Q(t)] - [Q(t) - 1]$	-2.87***	2.85***	-3.15***	2.03***
	(-6.62)	(7.69)	(-11.41)	(13.88)

Panel F : Complete vs. Withdrawn deals

	Complete (N=5,896)		Withdrawn (N=1,288)	
	Mutual funds	Hedge funds	Mutual funds	Hedge funds
$Q(t) - 4$	11.80	3.34	11.63	3.60
$Q(t) - 3$	11.97	3.51	11.76	3.75
$Q(t) - 2$	11.89	3.70	11.51	3.96
$Q(t) - 1$	11.58	3.93	10.94	4.39
$Q(t)$	8.13	6.13	9.54	6.14
$[Q(t) - 1] - [Q(t) - 2]$	-0.31*	0.23***	-0.57***	0.43***
	(-1.90)	(5.74)	(-2.88)	(4.44)
$[Q(t) - 1] - [Q(t) - 3]$	-0.39***	0.42***	-0.82***	0.64***
	(-2.56)	(6.57)	(-4.39)	(5.25)
$[Q(t) - 1] - [Q(t) - 4]$	-0.22	0.59***	-0.69**	0.79***
	(-0.90)	(7.47)	(-2.34)	(5.83)
$[Q(t)] - [Q(t) - 1]$	-3.49***	2.20***	-1.46***	1.75***
	(-11.75)	(13.71)	(-5.61)	(8.91)

Table 7: Mutual fund and hedge fund ownership in takeover targets by announcement timing

This table reports the average mutual fund and hedge fund ownership (in %) for the target firms sorted based on the timing of the deal announcement during the event quarter. The first two columns report the average ownership in takeover targets associated with the deals announced in the first 20 calendar days of the announcement quarter. The middle two columns report the average fund ownership in targets associated with the deals announced in the last 20 days of the event quarter, and the last two columns show these statistics for the remaining deals. 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. Standard errors are clustered at the quarter level. The t-statistics are shown in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Deals announced in the first 20 days of the quarter (N=1,479)		Deals announced in the last 20 days of the quarter (N=1,632)		Deals announced in the middle of the event quarter (N=4,073)	
	Mutual funds	Hedge funds	Mutual funds	Hedge funds	Mutual funds	Hedge funds
$Q(t)-4$	12.23	3.47	11.37	3.29	11.76	3.39
$Q(t)-3$	12.34	3.59	11.36	3.43	12.02	3.59
$Q(t)-2$	12.17	3.78	11.49	3.59	11.84	3.80
$Q(t)-1$	11.35	4.14	11.28	3.85	11.56	4.04
$Q(t)$	7.63	5.92	9.56	5.82	8.16	6.32
$[Q(t)-1]-[Q(t)-2]$	-0.82***	0.36***	-0.21	0.26***	-0.28	0.24***
	(-3.98)	(4.35)	(-1.16)	(3.97)	(-1.41)	(4.86)
$[Q(t)-1]-[Q(t)-3]$	-0.99***	0.55***	-0.08	0.42***	-0.46***	0.45***
	(-4.74)	(4.84)	(-0.34)	(4.91)	(-2.73)	(6.23)
$[Q(t)-1]-[Q(t)-4]$	-0.88***	0.67***	-0.09	0.56***	-0.20	0.65***
	(-2.96)	(5.26)	(-0.33)	(5.00)	(-0.72)	(7.48)
$[Q(t)]-[Q(t)-1]$	-3.73***	1.78***	-1.75***	1.97***	-3.48***	2.28***
	(-10.17)	(9.50)	(-6.09)	(12.71)	(-12.13)	(12.09)

Table 8: Tests with daily mutual fund returns

Conditional on fund ownership of target at $Q(t)-1$, we compare the actual (i.e., reported) fund return with the holdings-based return including and excluding the target stock over a three-day window around the announcement. When the target firm is excluded, we rebalance the portfolio proportionally. The holdings-based-return is calculated as the value-weighted average three-day return across various asset classes of the portfolio composition. For each fund at $Q(t)-1$, we obtain the percent of a portfolio allocated to equities, cash, and bonds/preferred stocks from the CRSP fund summary file. The return on the equity part of the portfolio is based on mutual fund holdings at $Q(t)-1$ and is obtained by multiplying the stock weight by the corresponding three-day stock return around the deal announcement date, and summing these products at the portfolio level. We proxy for the cash and bond/preferred stock returns using published indices. For bonds and preferred stocks, we use the total return of the Bloomberg Barclays US Aggregate Bond Index, while for cash holdings we use the one-month Treasury bill rate. We adjust the holdings-based returns for the three-day expense ratio, obtained by dividing the annual fund expense ratio into 250 and multiplying by 3. Panel A reports these returns for both the treatment and control groups. The control group is obtained following the methodology described in Table 3, and the analysis is also conditional on fund ownership of control firm at $Q(t)-1$. Standard errors are clustered at the quarter level. We explore the announcement effects in a regression framework in Panel B. The dependent variable is the reported three-day fund return around the deal announcement minus the fund's holdings return including the target. The announcement effect is defined as a product of a fund's allocated portfolio weight to the target firm at the end of $Q(t)-1$ and the three-day target's return around the announcement day. Similarly, we define the announcement effect for the control group. The standard errors in both regressions are clustered at the quarter level. The t-statistics are shown in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A : Tests with daily fund returns - univariate

	Reported fund return (1)	Holdings return incl. target (2)	Holdings return excl. target (3)	Difference (1)-(2)	Difference (2)-(3)	Difference (1)-(3)
Funds (A)	0.211	0.243	0.165	-0.032***	0.078***	0.046***
(2,719 deals)				(-4.42)	(24.87)	(6.05)
Control funds (B)	0.145	0.166	0.165	-0.021***	0.001***	-0.020**
(2,392 deals)				(-2.70)	(2.59)	(-2.50)
Difference (A-B)	0.066*	0.077*	0.000	-0.011*	0.077***	0.066***
	(1.67)	(1.69)	(0.00)	(-1.72)	(30.79)	(9.95)

Panel B : Dependent variable is the reported fund return net of the holdings return including the target

	Funds holding target firm	Funds holding control firm
Announcement effect	-0.312***	0.201
	(-11.70)	(1.41)
Holdings return incl. target	-0.029**	-0.029**
	(-2.43)	(-2.44)
Number of observations	2,497,504	2,170,053

Table 9: Short selling of targets and acquirers prior to M&A announcements

We examine the short selling activity of targets and acquirers around M&A announcements. This table reports the percentage of shares shorted between six months prior and the M&A announcement month, $M(t)$. The report with shares held short is published in the middle of each month. For deals announced in the first half of a month (that is, before the short interest report), we treat the short interest report one month prior to the M&A announcement month as a report in month $M(t) - 1$. For deals announced after the short interest report is published, we treat the short interest report in the M&A announcement month as a report in month $M(t) - 1$. Standard errors are clustered at the quarter level. The t-statistics are shown in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

| | Targets | | Acquirers | |
	% shares held short	Number of deals	% shares held short	Number of deals
$M(t) - 6$	3.84	3,335	3.15	1,818
$M(t) - 5$	3.86	3,335	3.20	1,818
$M(t) - 4$	3.90	3,335	3.24	1,818
$M(t) - 3$	3.92	3,335	3.25	1,818
$M(t) - 2$	3.96	3,335	3.29	1,818
$M(t) - 1$	3.98	3,335	3.28	1,818
$M(t)$	3.45	3,285	3.75	1,818
$[M(t) - 1] - [M(t) - 2]$	0.02		-0.01	
	(0.83)		(-0.27)	
$[M(t) - 1] - [M(t) - 3]$	0.06		0.03	
	(1.37)		(0.82)	
$[M(t) - 1] - [M(t) - 4]$	0.08		0.04	
	(1.23)		(0.88)	
$[M(t) - 1] - [M(t) - 5]$	0.12		0.08	
	(1.45)		(1.35)	
$[M(t) - 1] - [M(t) - 6]$	0.14		0.13**	
	(1.48)		(2.03)	
$[M(t)] - [M(t) - 1]$	-0.53***		0.47***	
	(-7.65)		(11.15)	

Table 10: Ownership by mutual funds affiliated with M&A advisors

This table reports the target ownership by mutual funds whose management company serves as an M&A advisor to target and bidder firms in quarters around M&A announcements. Standard errors are clustered at the quarter level. *t*-statistics are reported in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Management company is affiliated with:	
	Target's M&A advisors	Acquirer's M&A advisors
	(N=1,939)	(N=1,770)
$Q(t) - 4$	0.054	0.074
$Q(t) - 3$	0.066	0.067
$Q(t) - 2$	0.071	0.063
$Q(t) - 1$	0.070	0.060
$Q(t)$	0.034	0.035
$[Q(t) - 1] - [Q(t) - 2]$	-0.001	-0.003
	(-0.12)	(-0.67)
$[Q(t) - 1] - [Q(t) - 3]$	0.004	-0.007
	(0.82)	(-1.44)
$[Q(t) - 1] - [Q(t) - 4]$	0.016**	-0.014***
	(2.52)	(-2.16)
$[Q(t)] - [Q(t) - 1]$	-0.036***	-0.025***
	(-6.09)	(-5.56)

Table 11: Ownership by hedge fund activists

The first column reports the percentage of total shares outstanding held by hedge fund activists in all M&A target firms in our sample. The second column reports hedge fund ownership for transactions excluding the activist hedge funds in all M&A target firms in our sample. The third column reports the hedge fund activist ownership in 76 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 fourth column shows the evolution in ownership in these 76 firms by non-activist hedge funds. The last column reports the total hedge fund ownership for all hedge fund ownership in the 76 activism and takeover targets, respectively. Standard errors are clustered at the quarter level. t-statistics are reported in parentheses. Symbols ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Ownership of Any M&A Targets by Activist Hedge Funds (N=7,184)	Ownership of Any M&A Targets by Non-Activist Hedge Funds (N=7,184)	Ownership of Activism and M&A Targets by Activist Hedge Funds (N=76)	Ownership of Activism and M&A Targets by Non-Activist Hedge Funds (N=76)	Ownership of Activism and M&A Targets by Any Hedge Funds (N=76)
$Q(t)-4$	0.048	3.25	6.59	12.54	19.13
$Q(t)-3$	0.061	3.40	7.83	14.85	22.69
$Q(t)-2$	0.073	3.58	9.17	15.81	24.98
$Q(t)-1$	0.090	3.83	11.57	16.47	28.04
$Q(t)$	0.083	8.26	9.88	21.61	31.15
$[Q(t)-1]-[Q(t)-2]$	0.017***	0.25***	2.40***	0.66	3.06***
	(3.60)	(5.85)	(2.96)	(0.97)	(2.57)
$[Q(t)-1]-[Q(t)-3]$	0.029***	0.43***	3.73***	1.62	5.35***
	(3.68)	(6.68)	(3.65)	(1.28)	(3.26)
$[Q(t)-1]-[Q(t)-4]$	0.042***	0.58***	4.97***	3.93**	8.91***
	(4.68)	(7.43)	(5.09)	(2.39)	(4.57)
$[Q(t)]-[Q(t)-1]$	-0.007	4.43***	-1.69**	5.14**	3.11
	(-1.48)	(20.68)	(-2.04)	(2.36)	(1.32)

Table 12: Persistence in mutual fund and hedge fund weights

We sort all mutual funds based on the total portfolio weights of holdings in M&A targets at the end of the quarter prior to the announcement quarter. The first group corresponds to funds which do not own any M&A target stocks at the end of $Q(t)-1$. The remaining funds that own at least one M&A target stock are divided into terciles based on the weight invested in target stocks at the end of $Q(t)-1$. We compute their portfolio weights in future to-be targets in subsequent quarters between $Q(t)$ and $Q(t)+3$. Panel A reports average weights allocated to to-be targets by mutual funds in each group 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 : Weights in M&A target stocks by mutual funds

	Zero Holdings	Terciles			Difference High - Low	Difference High - Zero
		Low	Mid	High		
$Q(t)-1$	0	0.45	1.29	3.33	2.88	3.33
$Q(t)$	0.49	0.57	0.67	0.74	0.17***	0.25***
					(4.34)	(4.86)
$Q(t)+1$	0.43	0.70	0.82	0.86	0.16***	0.43***
					(4.57)	(7.73)
$Q(t)+2$	0.50	0.56	0.69	0.73	0.17***	0.23***
					(3.98)	(4.58)
$Q(t)+3$	0.46	0.70	0.79	0.88	0.18***	0.43***
					(5.67)	(9.99)

Panel B : Weights in M&A target stocks by hedge funds

	Zero Holdings	Terciles			Difference High - Low	Difference High - Zero
		Low	Mid	High		
$Q(t)-1$	0	0.39	1.53	7.07	6.68	7.07
$Q(t)$	1.21	1.24	1.34	2.02	0.78***	0.81***
					(2.79)	(3.19)
$Q(t)+1$	1.18	1.21	1.28	1.71	0.50***	0.53***
					(5.77)	(5.32)
$Q(t)+2$	1.19	1.19	1.33	1.70	0.51***	0.51***
					(5.45)	(5.25)
$Q(t)+3$	1.14	1.20	1.41	1.64	0.44***	0.50***
					(5.29)	(6.54)

Table 13: Mutual fund trading in takeover targets and fund activeness

This table shows the relation between trading targets and fund activeness. For each target, we merge all funds in the sample that exist at the time of the deal announcement. We repeat this procedure with the control group firms, and integrate the obtained two datasets. The unit of observation is fund-firm level, where firm refers to either a target company or its corresponding control group firm. The control group is obtained from the precedure described in Table 3. $Target\ firm$ equals 1 if a firm is a takeover target, and is 0 if a firm is a corresponding control group company. The dependent variable is a fund's difference in $log(1 + shares_{Q(t)-1})$ and $log(1 + shares_{Q(t)-2})$, given that $Q(t)$ is the announcement quarter. If a fund does not hold a potential target (or a firm from the control group), its number of adjusted shares is 0. A vector of controls consists of firm and fund characteristics: a fund's TNA, a fund's age, a fund's expense ratio, a fund's turnover ratio, a fund's flows, a firm's market capitalization, a firm's stock return in quarter $(t-1)$ and its stock return in $(t-2)$, as well as a firm's stock turnover ratio. The activeness variable is either Active Share (Model (1)), Fund (1-R^2) (Model (2)), or the absolute value of Return Gap (Model (3)). Since Active Share data is annual, for each fund×quarter observation, we take Active Share of a fund for the year preceding the merger announcement year. All independent variables (except Active Share) are measured as of quarter $Q(t)-2$, plus a firm's stock return that is measured at $Q(t)-1$. In model (1), Active Share is measured as of year before the merger announcement year. All continuous variables are winsorized at the 1% level. 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	Fund (1-R^2)	| Return Gap |
	(1)	(2)	(3)
Activeness×Target firm	0.247***	0.246***	0.071***
	(3.96)	(4.54)	(7.21)
Activeness	0.001	0.094**	-0.031***
	(0.02)	(2.05)	(-3.97)
Target firm	-0.289***	-0.117***	-0.101***
	(-5.34)	(-10.77)	(-12.33)
Intercept	0.543***	0.539***	0.559***
	(5.96)	(7.13)	(8.35)
Firm and fund controls	Yes	Yes	Yes
Time and 2-digit SIC fixed effects	Yes	Yes	Yes
R^2 (%)	0.82	0.97	0.96
Number of observations	4,800,549	7,068,999	7,156,118