Insider Trading in Firms Rumored to be Takeover Targets

Frederick Davis [1], Hamed Khadivar [1], Kuntara Pukthuanthong [2], Thomas J. Walker [1]

Abstract:

We examine insider trading of both managing and non-managing insiders for a sample of 1,642 initial takeover rumors during the period 2002 - 2011. Using difference-in-difference regressions of various insider-trading measures, we find that insider net purchases are significantly higher within the year prior to the first publication of a takeover rumor as compared to both a matched sample and to the preceding year. Such trading is more prevalent when rumor articles are either accurate (lead to a takeover announcement) or informative (provide substantial justification for the rumor's publication), and when individuals who are better informed (managing insiders) are doing the trading. Additionally, our results show that insider trades can predict takeover announcements, as well as form the basis for a trading strategy yielding significantly positive abnormal returns before trading costs. This has implications for regulators attempting to identify and restrict the degree to which insiders act on and benefit from material, private information. Since the rumors in our sample occur an average of 133 days prior to any forthcoming announcement, our findings provide some of the earliest evidence of insider trading linked to merger proposals. They thus also contribute to an understanding of insider-trading behavior when short-swing profit liability

[1] Department of Finance, John Molson School of Business, Concordia University, Montreal, Canada
[2] College of Business Administration, San Diego State University, San Diego, California, USA

regulations under Section 16(b) of the Exchange Act and company-imposed blackout periods are unlikely to be central considerations.

Keywords: Insider trading, Takeover rumors, Rumored targets, Takeover announcements, Mergers and acquisitions, Short-swing

1. Introduction

Insider trading in the U.S. is regulated under the Securities Exchange Act of 1934, with the Securities Exchange Commission (SEC) largely responsible for its enforcement. As discussed in detail in Agrawal and Nasser (2012), there are four main regulations governing insider trading. First, Section 10(b) of the Act and SEC Rule 10b-5 prohibit trades based on material, non-public information. This applies to anyone who comes into possession of such information and owes a fiduciary duty[3]. Second, registered corporate insiders (i.e., corporate officers, directors, and shareholders owning 10% or more of the firm) are required to report their trades to the SEC under Section 16a. Third, Section 16b, known as the short-swing rule, requires registered corporate insiders to surrender any profits on round-trip trades (i.e., a purchase followed by a sale or vice-versa) made within a six-month period and return these profits to the corporation. A suit to enforce this rule can only be brought by a shareholder, not the SEC. Finally, Rule 14e-3 prohibits anyone from trading based on material, non-public information about an upcoming tender-offer after the bidder has taken substantial steps toward making the offer. Further, it prohibits the divulgence of confidential information about this offer to anyone who might trade on it.

While insider trading might improve market efficiency, assist firms in compensating managers, and induce innovation (cf., Manne, 1966; Leland, 1992; Roulstone, 2003; Piotroski and Roulstone, 2005), such trading can also undermine investor confidence, destabilize investment, and pose a threat to the operation of financial markets (Levitt, 1998; Fishe and Robe, 2004; Bris, 2005; Eder, 2011). Understanding the nature of insider trading and the consequences thereof is thus of considerable importance.

[3] However, as Bhattacharya (2014, pp. 4) points out, the fiduciary duty element may not be necessary, as the SEC has chosen to act in order to "maintain the fairness and integrity of markets", in accordance with the 1934 Securities Act.

Corporate insiders have financial incentives to utilize their information advantage prior to many corporate events. For instance, informed insider trading has been documented prior to Chapter 11 bankruptcy filings (Seyhun and Bradley, 1997), stock repurchases (Lee et al., 1992), seasoned equity offerings (Karpoff and Lee, 1991), earnings announcements (Penman, 1985), dividend initiations (John and Lang, 1991), takeover announcements (Agrawal and Nasser, 2012) and earnings restatements (Agrawal and Cooper, 2015). Of these events, insider-trading activity prior to takeover announcements has been particularly popular and problematic. Indeed, over 40% of companies receiving buyout bids exhibit suspicious trading in the weeks prior, and a New York Times investigation into illicit trading ahead of merger announcements concludes that such activities have become a systemic problem with severe consequences (Morgenson, 2006). The ubiquity of this problem is likely due to a powerful incentive: takeover premiums average 46% (Betton et al., 2009), thus rewarding those who purchase target shares in advance of the announcement.

In this paper, we analyze insider trading relative to the date of the initial published rumor speculating that a firm may become the target of an acquisition. To the best of our knowledge, trading prior to takeover rumors has not previously been studied in the literature. We contend that insiders often have knowledge of activities that lead to the creation of a target-firm takeover rumor prior to the rumor's publication. Such activities might include the hiring of a financial advisor specializing in M&A, the initiation by the target firm of a public request for bids, a block purchase of shares, involvement of private equity firms in a bid, the arrangement of potential financing, existing concerns over current management, or indications of pending bids as provided by an anonymous company source. Given that takeover rumors result in significantly positive event-date

returns and are thus material[4], insiders acting on related information before it is publicly released could be trading illegally. Such activity should thus be of interest to regulatory authorities as well as to academics who study this behaviour.

This study concerns takeover rumors that generally occur well in advance of future takeover announcements (an average of 133 days), if the bid does indeed transpire (only 33% of rumors in our sample end in a takeover bid). Despite increased bid uncertainty, trading prior to the release of rumors provides insiders with a number of advantages compared to trading shortly before a takeover announcement. First, bidder-target takeover negotiations may not yet have begun, thus reducing the likelihood that the SEC will scrutinize transactions and uncover evidence of trading based on material, private information. In support of this view, Ke et al. (2003) note that with respect to insider-trading prosecution, "risks are smaller the further removed the trades are from the principal informational event". These authors also present evidence of insiders anticipating events early, up to two years in advance of earning reports. Second, trading prior to takeover rumors affords insiders the opportunity to capitalize on the aforementioned positive target-firm rumor-date CARs, while simultaneously pre-empting other investors who may purchase shares post-rumor, thereby increasing the cost to the insider of establishing a stake in the target firm. In general, superior trade execution may be possible in the presence of falsely informed traders[5] (Cornell and Sirri, 1992); however once private information becomes widely disseminated, it loses its value. Third, early trading by insiders pre-empts the possible implementation by the target firm of a blackout period prohibiting insider trades as merger negotiations progress. Bettis et al. (2000) indicate that such company oversight, at least with respect to earnings announcements, is

[4] Betton et al. (2018) report returns of 3.81% for all initial target firm takeover rumors over the (0, +1) period, with accurate rumors providing an 8.37% return and non-accurate rumors a 2.62% return.
[5] Falsely informed traders are defined in Cornell and Sirri (1992) as those trading in the absence of private information.

prevalent: over 92% of firms in their sample have policies restricting trading by insiders, and 78% have explicit blackout periods during which insider trading is expressly prohibited. Finally, trading in rumored (as opposed to announced) target firms permits a much longer window prior to merger completion, which typically occurs three to five months after the takeover announcement (Sanders and Zdanowicz, 1992; Anilowski et al., 2009). Such advance trading thus reduces the likelihood of relinquishing any profits made due to activation of the short-swing rule[6] resulting from the forced sale of target shares (which occurs naturally at merger completion).

The present study examines abnormal insider-trading behavior within 1,642 firms rumored to be the target of a takeover attempt between January 2002 and December 2011. We hypothesize that insiders, and in particular managing insiders, increase their net position in rumored takeover targets before material information (the rumor's release) is made public. First, we use a time-series control in which we compare insiders' trades shortly before the takeover rumor to their historical level. Second, we utilize a cross-sectional control in which we match every rumored firm with a similarly-sized control firm from the same 3-digit Compustat primary SIC industry. We use difference-in-differences (D-i-D) methodology to simultaneously control for cross-sectional and time-series dependence, while including other determinants of insider trading as described in Section 4. In addition, because different types of insider may not have equal access to private information, we divide our sample into two mutually exclusive groups in line with the literature. All corporate directors and officers (who are in charge of principal business units, divisions, or functions) are classified as managing insiders, while committee members, affiliates, beneficial

[6] Section 16(b) of the Securities Act requires company insiders to return any profits made from the purchase/sale and subsequent sale/purchase of company stock if both transactions occur within a six-month period.

owners, and others are classified as non-managing insiders (cf., Ravina and Sapienza, 2009; Betton et al., 2018).

Our findings indicate that insiders do engage in abnormal trading prior to takeover rumors, by means of a passive trading strategy: insiders reduce their sales prior to the rumor's publication, leading to a significant increase in net purchases. This effect is more significant when rumors are more 'informative' (i.e., more details within the rumor justify its publication), and when they are 'accurate' (i.e., a takeover announcement occurs within 365 days after the initial publication of the rumor). Abnormal trading is also more significant among managing (as opposed to non-managing) insiders. Such trading is shown to be significantly profitable, in the absence of trading costs, according to long-short portfolio returns calculated over periods of either six months or one year. The results are also economically meaningful: Managing insiders increase the amount (value) of their net purchases by 36% (48%), with monthly returns of 0.575% over six months.

In addition, we examine whether insider trading before the rumor date can predict subsequent takeover announcements. Specifically, we conduct a logit regression in which the main independent variable of interest is the abnormal level of insider trading, calculated as the level of insider trading during the study period (one year prior to the rumor) minus the level of insider trading during the control period (the second year prior to the rumor). Our results show that insider trades prior to takeover rumors are indeed significant in predicting forthcoming takeover announcements, even while controlling extensively for other determinants of takeover candidacy.

We contribute to the literature in a number of ways. First and foremost, we extend the body of research that explores insider trading surrounding corporate events: to the best of our knowledge, no prior empirical study provides a detailed examination of insider trading in firms rumored to be takeover targets. This has implications for regulators attempting to identify and restrict the degree

to which insiders act on and benefit from material, private information. Secondly, we provide additional support to the contention that not all insider types have equivalent access to private information (e.g., Seyhun, 1986; Piotroski and Roulstone, 2005; Ravina and Sapienza, 2009). Thirdly, we contribute to the takeover predictability literature by finding that insider trades occurring prior to a rumor's initial publication significantly predict future takeover announcements. Finally, we enter the debate on the rationale behind passive trading strategies, which rely on reduced sales rather than increased purchases to achieve a positive net trading position. Agrawal and Nasser (2012) conclude that passive strategies are likely driven by more potent enforcement of the short-swing trading rule by private attorneys as compared to public enforcement of insider trading by the SEC. However, despite private enforcement being an unlikely concern for insiders in our sample period[7], we similarly observe passive trading rather than active trading.

The remainder of this paper is organized as follows. Section 2 briefly summarizes the existing empirical evidence on insider trading related to corporate events. Section 3 describes our data and methodology. Section 4 presents our results, while Section 5 presents a series of robustness tests. Finally, Section 6 provides a summary and conclusion of our work.

2. LITERATURE REVIEW

Early studies show that trades carried out by insiders are profitable, implying that they use their information advantage over other market participants. Lorie and Niederhoffer (1968) find that insiders of U.S. firms are able to make excess profits by selling (buying) prior to large decreases

[7] Only 33% of sample rumors lead to takeover announcements, and of these, only 43% result in successful completion within six months of the rumor. Thus, profits from *active* trading (i.e., purchases) would typically be unaffected by the short-swing rule prohibiting profits on round-trip trades occurring within six months.

(increases) in stock price. Similarly, Jaffe (1974a) and Finnerty (1976a) show insiders' ability to predict stock price movements over short-term periods, with stock prices tending to increase (decrease) during months in which insiders buy (sell). Other studies such as those by Seyhun (1988), Lin and Howe (1993), Seyhun (1992), and Meulbroek (1992) report similar findings, all of which imply that insiders earn excess returns on their trades based on non-public information that is not yet reflected in stock prices.

Some authors analyze the differences in insider-trading activities according to the type of insider. Seyhun (1986), using approximately 60,000 insider transactions during the period 1975-1981, shows that the quality of information diverges by type of insider: trades done by insiders who are perceived to be more knowledgeable tend to have better predictive power of future abnormal stock price changes over a two-month period. Ravina and Sapienza (2009) show that independent directors earn higher returns than other executives or large shareholders, especially when corporate governance is weak.

Cohen et al. (2012) note that it is opportunistic rather than routine insider trades that are predictive of future stock returns. Various studies have provided examples of such opportunities: For example, insiders trade profitably before earnings announcements (Penman, 1985), dividend initiations (John and Lang, 1991), seasoned equity offerings (Karpoff and Lee, 1991), stock repurchases (Lee et al., 1992), Chapter 11 bankruptcy filings (Seyhun and Bradley, 1997), and earnings restatements (Agrawal and Cooper, 2015). In general, insiders are more likely to trade on private information that proves to be more profitable (Agrawal and Nasser, 2012).

The literature presents somewhat mixed findings regarding insider trading prior to the announcement of a merger or acquisition. Agrawal and Jaffe (1995) examine the volume of insider sales and purchases in takeover targets from 1941 to 1961. They determine the effect of the only

specified insider trading law of that time period, the short-swing rule, in deterring insiders from pre-merger trading. The results show that insiders do reduce their purchases before takeover announcements, which is attributed to the forced sale (and relinquishment of profits) of any purchases made within six months prior to the merger. However, the authors find it surprising that sales are not reduced, and thus net trading does not occur, despite the fact that this would be to the benefit of insiders. In a similar study, Madison et al. (2004) examine insider purchases and sales prior to acquisition announcements of banks from 1991-1997, when the Insider Trading Sanctions Act of 1984 (ITSA), the Insider Trading and Securities Fraud Enforcement Act of 1988 (ITSFEA), and the short-swing rule were all in effect.[8] Using several insider-trading measures, their results show that insiders reduce both their purchases and (to a lesser degree) their sales prior to the merger announcement.

In the paper closest to ours, Agrawal and Nasser (2012) provide evidence of opportunistic insider trading before takeover announcements by examining the level of target insider purchases, sales, and net purchases in a sample of 3,701 acquisitions announced during the period 1988-2006. They declare that insiders use a passive trading strategy to profit from stock price increases upon the takeover announcement: specifically, although insiders reduce their purchases before announcements, they reduce their sales even more, leading to an increase in net purchases. In fact, there is an increase of approximately 50% in the dollar value of the takeover targets' net purchases. This pattern of passive insider trading seems to suggest that insiders attempt to benefit from their private information while seemingly complying with SEC rules - rather than profiting through share purchases or sales, they benefit by retaining their shares longer than usual.

[8] ITSA allows the SEC to impose a civil penalty of up to three times the illegal profit made (or similarly, losses avoided) by an insider. ITSFEA allows the Justice Department to impose criminal penalties on guilty insiders.

Interestingly, finding only *passive* rather than *active* insider trading before acquisition announcements contrasts with findings before other corporate events. According to Agrawal and Nasser (2012), this suggests that private enforcement is more effective than public enforcement: insiders appear to be dissuaded from increasing their purchases prior to merger announcements[9] due to the possibility of shareholder suits being brought against them in violation of the short-swing rule.

Our paper differs from the above by testing for abnormal insider trading prior to a related yet distinct event: the initial published rumor that a firm may be an impending takeover target. This allows us to investigate insider trading relative to a unique precursor event, both as a potential determinant in predicting takeover announcements, and as a potentially profitable trading strategy. This line of investigation also provides an opportunity to determine the pervasiveness of potentially illegal insider trading prior to corporate events, and to determine whether active trading strategies are observed when forced sales from merger completion are less of a concern.

3. DATA AND METHODOLOGY

3.1 Sample of takeover-rumored firms

Betton et al. (2018) provide the largest database of published takeover-rumor articles to date: 2,074 observations between January 2002 and December 2011. These data were collected by manually searching through Capital IQ, Factiva, ProQuest, Standard & Poor's Takeover Talk, and Zephyr to find the first reported rumor (within a 180 day window) indicating that a firm may be a potential

[9] The merger announcement is deemed to be different from other corporate events, as completion of the merger will force the sale of target shares, thus making any profits made from purchases of such stock subject to enforcement of the short-swing rule.

takeover target. Since Securities Data Corporation (SDC) accuracy has been criticized in several studies (Bharadwaj and Shivdasani, 2003; Faccio and Masulis, 2005; Barnes et al., 2014; Mulherin and Simsir, 2015), the authors also verify announcement dates using Factiva and Google to correct for SDC announcement date errors and omissions. In order to preserve a clear distinction between rumors and takeover announcements, they exclude rumors in which either the rumored bidder or the target confirms that negotiations are underway.

Using the content of each article, Betton et al. (2018) identify sixteen main *rationales* (e.g., M&A advisor hired, synergies cited, analyst reported) behind takeover rumors justifying the article's publication (see Appendix A). In addition, two mutually exclusive rumor categories (*speculative* versus *informative*) are created based on the degree to which the rumor justification exhibits a connection to future takeover activity. *Speculative* rumors are based on either takeover chatter or an increase in option activity in the target firm, without any further rationales (i.e., justifications) for the rumor. *Informative* rumors are based on at least three rumor justifications, excluding those labelled as speculative. In addition, rumors are labelled as *accurate* if the firm in question is indeed the target of a formal takeover bid within 365 days after the rumor date. Some examples of rumors from different categories can be found in Betton et al. (2018).

We apply several screens to the initial sample of 2,074 rumor articles obtained from Betton et al. (2018) to attain our final sample. In order to prevent the control periods from overlapping with the study period of a firm, we only consider the first rumor for a firm if there is more than one during any one year-period. This results in the elimination of 222 rumor-firm observations from our sample. Since we obtain insider-trading data from Thomson Reuters' Insider Filing Data Feed (IFDF), we omit 33 firms that are not listed in the IFDF database. We rely on financial data from Compustat to construct several control variables and thus eliminate 105 firms that are not listed in

Compustat. Finally, our difference-in-difference (D-i-D) methodology requires data to be available for every variable during the control and study period before rumor publication (a two-year period in total). Thus, we delete an additional 72 firms with incomplete coverage on the CRSP, Compustat, and IFDF insider databases during the two-year period before the rumor publication. Our final sample includes 1,642 takeover-rumored firms.

3.2 Cross-sectional and time-series control samples

To identify abnormal insider-trading behavior within the rumored targets, we consider two sets of controls: cross-sectional controls and time-series controls. We match every rumored firm with a control firm from the same 3-digit Compustat primary SIC industry. In each case, the control firm is chosen as the firm that has the smallest percentage difference (relative to the target firm) in total assets at the end of fiscal year -2, where year 0 is the fiscal year in which the takeover rumor occurs. If we fail to find a match using 3-digit SIC codes, we use 2-digit SIC codes instead. We also compare the levels of insider trading in target and control firms during the pre-rumor period to their levels during the control period. The pre-rumor period is the one-year period prior to the takeover rumor announcement, while the control period is the year before that. This method thus assists us in finding trades that are non-representative of insiders' normal trading patterns, and follows very closely that of Agrawal and Nasser (2012).

3.3 Insider trading data and measures

We collect insider-trading data from the Insider Filing Data Feed (IFDF) provided by Thomson Reuters. Section 16a of the Securities Exchange Act of 1934 requires registered corporate insiders (i.e., corporate officers, directors, and 10% or larger blockholders) to report their trades as follows: Form 3 must be submitted by insiders registering equity securities for the first time; Form 4 is

required when changes in securities ownership occur, and must be submitted within two business days after the insiders' trades occur; finally, Form 5 is an annual statement of ownership and any exempted trades not reported on Form 4 must be reported on this form. Most IFDF filings are based on Form 4[10].

We separately examine insider purchases, sales, and net purchases. However, for brevity, we typically report the results for net purchases only throughout this paper. For insider purchases (sales) we construct three measures of insider trading: the number of shares bought (sold), the dollar value of shares bought (sold), and the percentage of outstanding equity bought (sold). To calculate the dollar value, we multiply the number of shares traded by insiders by the transaction price recorded on IFDF. If the transaction price is missing, we calculate the dollar value by multiplying the number of shares traded by the closing price reported on CRSP. All dollar values throughout the paper are in inflation-adjusted 2006 dollars. To obtain the percentage of outstanding equity bought (sold), we determine the number of shares bought (sold) by insiders as a percentage of the number of shares outstanding on the day that insiders trade. In order to examine the net effect of insider purchases and sales, we define the following three measures: the net number of shares bought by insiders (= #shares bought - #shares sold), the net dollar value of shares bought (= $bought - $sold), and the percentage of net equity bought (= %bought - %sold).

3.4 Regression specification

We conduct a series of regressions of insiders' net purchases on the potential determinants of insider trading. We use the aforementioned insider-trading measures as dependent variables. We

[10] We only consider open market purchases and sales of common stocks with CRSP share codes 10, 11 or 12. We exclude filings that are amended by subsequent filings and transactions that involve indirect ownership of shares through partnerships, corporations, trusts, and other entities. In addition, we exclude transactions that are marked as inaccurate or incomplete according to cleanse indicators provided within the IFDF.

calculate these measures for the sample and control firms, over both the study period (months (-12, -1) relative to the rumor's publication, also referred to herein as the pre-rumor period) and the control period (months (-24, -13) relative to the rumor's publication). The sample size here of 5,408 thus reflects the total number of yearly observations for our 1,352 rumored sample firms and the 1,352 corresponding matched firms over the two years prior to the rumor's publication[11]. Each regression includes four interrelated observations corresponding to each rumored firm: observations for the rumored firm within the study period and the control period, as well as observations for the control firm within these two periods. Our regression models identify these observations using dummy variables: *Rumored* equals one for rumored firms and zero for control firms; *Pre-rumor* equals one within the study period and zero within the control period.

In our regression models, we control for firm size (Seyhun, 1986), firm risk (Meulbroek, 2000), change in equity risk (Demsetz and Lehn, 1985; Jin, 2002; Aggarwal and Samwick, 2003), prior return (Lakonishok and Lee, 2001), the book-to-market (B/M) ratio of the firm (Jenter, 2005), firm profitability (Corenett et al., 2012), information asymmetry (Aboody and Lev, 2000), and liquidity (Grossman and Stiglitz, 1980; Kyle, 1985; Holmstrom and Tirole, 1993). The motivation for the inclusion of these control variables is thus motivated by the literature.

We follow Agrawal and Nasser (2012) to construct these control variables, calculated at the end of the fiscal year prior to the control or pre-rumor period unless otherwise specified. To account for prior returns, we separately measure the average daily market-adjusted return for each quarter *t*, and define the variable representing this as $PRET_t$. To control for risk, σ, we use the standard deviation of the equally-weighted daily stock returns over the period (-250, -126) relative to the

[11] Our sample size decreases somewhat from 1,642 due to matching considerations as well as incomplete data availability from CRSP and Compustat.

beginning of the control or pre-rumor period. In addition, we define the change in equity risk, Δσ, as the difference between σ and the standard deviation of daily stock returns over trading days (-125, -1) relative to the beginning of the control or pre-rumor period. We measure profitability using the return on assets, ROA, defined as the ratio of net income before extraordinary (or nonrecurring) items to total assets. To control for the level of information asymmetry in the firm we use the ratio of R&D expenses over sales revenue, R&D/Sales, which equals zero if R&D expenses are missing in Compustat. To account for liquidity, we use the daily average of the ratio of share trading volume to the number of shares outstanding. Finally, as insiders are more likely to trade on private information that proves to be valuable, we use rumor date returns, CAR(0,+1), to control for insiders' incentives to exploit their private information (Ahern and Sosyura , 2015; Betton et al., 2018).

We also include control variables that have been shown in the literature to impact target firm takeover candidacy and rumor accuracy, and thus potentially provide incentive for insiders to trade. These variables (defined in Appendix A) include the following proxies for management's motives to generate shareholder value or to engage in opportunistic behavior: *Cashratio, Changesize2yrs, Concentration, Dormancy, PrevMergers, Priorreturn2yrs, ResMismatch, Salesgrowth2yrs, Salesshock, SalesshockSquared,* and *Shareturnover,* as per Cornett et al. (2011) and Betton et al. (2018). The control variables also include a measure of firm newsworthiness, *ValuableBrand,* as per Ahern and Sosyura (2015).

4. RESULTS

Table 1 presents summary distributions for the 1,642 rumored firms in our final sample. As shown

in Panel A, the number of rumors per year increases during the investigated period and reaches a peak in 2009, in which there are 309 rumored-firm observations. Interestingly, our sample includes 489 takeover rumors during the financial crisis (2008-2009). Panel B outlines the sample distribution according to Fama-French 17 industry classifications and shows that our sample includes firms from a wide range of industries. It also reports the industry distribution of active firms listed on CRSP as of December 31, 2011, in which banks, insurance companies, and other financials represent the majority of firms.

Insert Table 1 about here

Table 2 reports descriptive statistics for the rumor sample and the matched control sample. In addition, it reports the p-values for a series of univariate two-tailed t-tests of the differences in means. Although most rumored target firms are medium-sized with median total assets (market value) of $1,275 ($1,750 million), the fact that the means are considerably larger than the medians indicates that our sample includes some very large rumored firms. The rumored targets and control firms have a relatively similar median operating performance and ratio of long-term debt to total assets. Rumored targets and control firms have similar stock volatilities and changes in volatility. While the median volatility for rumored targets (control firms) is 0.974% (0.970%), the median change in volatility is -0.006% (-0.009%).

Insert Table 2 about here

In Table 3, we perform a series of univariate t-tests of the difference in means for the three measures of insider net purchases, with Panels A - E segregating our results by rumor category. Columns 1 - 4 display information on mean insider-trading net purchases for rumored and control firms, either during the study period (one year prior to the takeover rumor date) or the control period (two years prior to the takeover rumor date). Columns 5 - 8 present the p-values for a variety of difference-in-means tests: Column 5 reports p-values for the differences in rumoured-firm net trading between the study and control periods; Column 6 reports p-values for the differences in net trading between the sample firms and the control group during the study period; Column 7 reports p-values for the differences in net trading between the study and control periods for control firms; finally, Column 8 reports p-values for the mean differences between Column 5 and Column 7 (i.e., the difference in net trading of *sample* firms between the study and control periods minus the difference in net trading of *control* firms between the study and control periods).

Significant results in Columns 5, 6, and 8 provide evidence of significant abnormal insider trading within our sample firms, while a lack of significance in Column 7 suggests no such trading within our control group, as required.

Restricting our discussion to the more robust difference-in-differences[12] results in Column 8, we see in Panel A that significant insider trading exists within the year prior to takeover rumors for two of our three insider-trading measures; this finding extends to all three measures once we restrict ourselves to rumors that lead to acquisitions within a year, as shown in Panel B. While insiders reduce both purchases and sales during the study period (untabulated for brevity), our results here indicate that the abnormal reduction in insiders' sales is far greater than the abnormal

[12] This methodology requires that the parallel trend assumption be valid during the pre-rumor period; i.e., that insider-trading trends are not significantly different between rumored and control firms prior to our analysis. We provide evidence of this in Section 5.

reduction in their purchases, leading to an overall increase in net purchases. Our insider trading results are not significant for inaccurate rumors in Panel C, Column 8; however, some evidence of insider trading can be seen in Columns 5 and 6, rendering the difference in trading behavior between accurate and inaccurate rumors unclear[13].

We further segregate rumors according to the publicly available content within the rumor, as per Betton et al., 2018. Panel D provides some evidence of positive insider net purchases prior to *informative* rumors (those containing three or more non-speculative justifications for the rumor's publication), while no such evidence exists for *speculative* rumors (those providing little to no justification for the rumor's publication), as shown in Panel E. These findings are consistent with insiders increasing their net positions in firms having greater prospects of becoming future acquisition targets.[14]

In sum, our findings support our hypothesis that insiders trade on private information prior to the publication of takeover rumors, particularly rumors that turn out to be accurate or are informative (contain multiple credible signals). These findings are robust to including both time-series and cross-sectional controls in a simultaneous framework. In addition, non-parametric Wilcoxon tests for the difference in medians provide similar support (untabulated). Our results also show that for accurate rumors, the pre-rumor insider-trading volume is almost twice that of the post-rumor (but before the official takeover announcement) insider-trading volume (untabulated). This finding underlines the importance of rumors relative to official takeover announcements and shows that insiders tend to act on private information before news dissemination.

[13] Generally speaking, insiders may wish to increase their net position regardless of rumor accuracy, as the rumor event itself is well known to cause an average increase in the share price.

[14] In our final sample of 1,642 takeover rumors, 251 rumors are categorized as speculative, while 437 rumors are labeled as informative. In addition, 21.7% (28.9%) of rumors yield an official takeover announcement within one (two) years after the rumor date and 14.4% (9.8%) of rumors come true within 180 (90) days after the rumor date.

Insert Table 3 about here

Panel A of Table 4 provides the regression results for the full sample. We first note that insider net purchases are significantly negatively correlated with firm size, as measured by the natural logarithm of market capitalization. This is in line with the findings of Seyhun (1986), who observes that insiders in small firms earn substantially greater abnormal returns than insiders in large firms, thus encouraging them to trade on their private information.

Of particular interest is the coefficient of our interaction indicator variable Pre-rumor*Rumored, which represents the abnormal level of insider purchases in rumored firms during the year prior to the rumor date relative to both the time-series and cross-sectional controls. Precisely, it indicates the difference between abnormal insider net purchases in rumored firms (insider net purchases during the study period minus insider net purchases during the control period) and abnormal insider net purchases in matched firms (insider net purchases during the study period minus insider net purchases during the control period). The positively significant coefficient of Pre-rumor*Rumored indicates that, on average, insiders of rumored firms significantly increase their net purchases during the study period as compared to the control period, and as compared to insiders of control firms. This finding provides multivariate support for our central premise that insiders increase their net position in rumored takeover targets before material information (the rumor's release) is available for public consumption.

Panel B provides the coefficient estimates of Pre-rumor*Rumored for insider trading according to the type of rumor. We find evidence of significantly positive coefficients for insider net purchases when rumors lead to a takeover announcement within one year (*accurate*) or when there is a

detailed justification of the rumor's rationale (*informative*), but not when rumors are *speculative* or turn out to be false. This supports our contention that insiders trade based on information that is materially relevant to the firm's prospects as a takeover target.

When takeover rumors occur in proximity to the takeover announcement, insiders may be trading on specific knowledge of the results of takeover negotiations, rather than on information related to the rumor. To minimize this effect, we therefore examine a subsample of 154 accurate rumors that were published four to twelve months in advance of the takeover announcement (Panel C, second row). We again find evidence of a significant increase in passive net insider purchases.

Panel D provides useful insights regarding the magnitude of the increase in insider net purchases by reporting the marginal effect (ME) and the % marginal effect (%ME)[15] of the Pre-rumor*Rumored indicator variable, and by partitioning results according to the type of insider. As indicated in the first row, insiders of rumored firms increase their net number of shares purchased during the pre-rumor period by a substantial 58% while controlling for both matched firms and the control period. Similarly, the net dollar value of shares purchased and the net percentage of equity bought by rumored-firm insiders increase by 44% and 32%, respectively. These results underline the fact that these types of trades represent a meaningful fraction of insiders' net positions.

The second and third rows of Panel D show the marginal effects according to the Relationship Code Classification of insider roles in Thomson Reuter's IFDF. We categorize insiders into two mutually exclusive groups: managing and non-managing insiders. All corporate directors and officers are categorized as managing insiders, whereas committee members, affiliates, beneficial

[15] We calculate ME as [{E(Dependent variable| Pre-rumor=1, Rumored=1, $\bar{X}$)−E(Dependent variable| Pre-rumor=1, Rumored=0, $\bar{X}$)}−{E(Dependent variable| Pre-rumor=0, Rumored=1, $\bar{X}$)−E(Dependent variable| Pre-rumor=0, Rumored=0, $\bar{X}$)}], where $\bar{X}$ includes all other covariates at their mean values. %ME is the absolute value of [100*(ME/ Mean of the dependent variable)].

owners, and others are considered non-managing insiders. A similar approach has been used in papers that compare the insider trading of executives relative to board members (e.g., Ravina and Sapienza, 2009; Davis et al., 2016) or that are otherwise concerned with differentiating trading activities according to the type of insider (e.g. Jiang et al., 2010; Wang et al., 2012; Ozkan and Trzeciakiewicz, 2014). Our results show that managing insiders significantly increase their net purchases prior to the rumor's publication, whereas non-managing insiders do not, further supporting our hypothesis that those with more intimate knowledge of material information related to future takeover activity are more likely to engage in net insider purchases prior to the publication of takeover rumors.

Agrawal and Nasser (2012) suggest that passive insider trading strategies prior to takeover announcements are likely driven by more potent enforcement of the short-swing trading rule by private attorneys as compared to public enforcement of insider trading by the SEC. They thus contend that insiders are dissuaded from active trading (based on purchases, as opposed to purchases net of sales) as any profits made would be expected to be relinquished to the firm[16].

Our sample provides a testing ground for a similar contention, as only 22% of sample rumors lead to takeover announcements, and of these, only 67% result in successful completion within six months of the rumor. We should thus *expect* to find evidence of active trading strategies, in addition to evidence of passive trading strategies, as profits from such trades in our sample would typically not be subject to forced sales and thus remain unaffected by the short-swing rule. We provide censored Tobit regression results for the coefficient estimates of Pre-rumor*Rumored for insider purchases (as opposed to net purchases) in all rumored firms in the first row of Panel E.

[16] Successful completion of a takeover results in forced sales of all target shares; as the short-swing rule disallows profits on round-trip trades made within six months, profits would be negated from any purchases made within six months prior to the takeover's completion.

We provide further results for subsamples representing instances in which the short-swing trading rule would seem to be of even less concern: for inaccurate rumors in the second row, and for accurate rumors occurring well in advance of the takeover announcement in the third row. In neither case do we find evidence of significantly positive insider purchases[17]. That is, despite private enforcement of the short-swing rule appearing to be of little consequence for insiders in our sample, we only observe passive trading rather than active trading. We view our results as suggestive of the notion that while insiders may be dissuaded from active trading prior to takeover rumors, this is not due to predicted enforcement of the short-swing rule.

Insert Table 4 about here

Interestingly, our untabulated results also indicate that managing insiders exhibit a significant increase in net trading within the year prior to *inaccurate* rumors, and a significant decrease in net trading within 180 days thereafter. Intuitively, this may be explained by managing insiders (those with the best access to firm prospects) wishing to exploit their information in order to capture the well-documented positive CAR on the rumor announcement date, which exists regardless of rumor accuracy, while avoiding the subsequent decline associated with false rumors[18].

Taken together, the above results support our hypothesis that insiders exploit material, private information related to takeover prospects for their personal benefit before this information is

[17] Interestingly, we do find some evidence of significantly *negative* purchases prior to rumors, in line with analysis prior to takeover announcements provided by Madison et al. (2004) and Agrawal and Nasser (2012). Our prior result of significantly positive net purchases stems from insiders reducing their sales much more than their purchases.

[18] In our sample, rumor date (0, +1) CARs are 3.89% on average, 8.72% for accurate rumors and 2.55% for inaccurate rumors. Inaccurate rumors experience a decline of 2.59% over the following 30 days.

conveyed to the public by means of a rumor announcement. On average, rumors occur 133 days in advance of any takeover announcement (when one is forthcoming). Such early trading may be of benefit to insiders for the following reasons: to avoid the repayment of profits due to the short-swing rule; to pre-empt any trading blackout-period imposed by the firm (Meulbroek, 1992; Bettis et al., 2000; Betzer and Theissen, 2009); and to minimize the risk of detection by the SEC (Marin and Olivier, 2008; Cohen et al., 2012; Adams et al., 2016).

To further demonstrate the importance of insider trading in firms prior to the publication of takeover rumors, we examine whether abnormal insider trading can predict rumor accuracy (i.e., rumors resulting in a takeover announcement within one calendar year). Table 5 shows the results of a logit regression where the dependent variable equals one if the rumored firm becomes subject to a takeover announcement within the following 365 days. The main independent variable of interest is the abnormal level of insider trading[19], using either the net number of shares purchased (Models 1 - 3), the net dollar value of shares purchased (Models 4 - 6), or the net percentage of equity purchased (Models 7 - 9). We include the rumor rationales as additional controls, as per Betton et al. (2018), as well as CAR (-5, -1) as per Chou et al. (2015).

Insert Table 5 about here

We find that abnormal insider net purchases are shown to be positive predictors of rumor accuracy, significant at the 5% level, regardless of the model employed or the insider-trading measure examined (*Net # shares*, *Net $ shares*, or *Net % equity*). This provides further evidence that insiders

[19] Calculated here as the level of insider trading during the study period (one year prior to the rumor) minus the level of insider trading measured during the control period (two years prior to the rumor), for the rumored firms only.

trade on private information prior to the rumor's publication, and contributes to the strands of literature examining the information content of insider trading (e.g., Rozeff and Jaffe, 1974; Seyhun, 1986; Zaman, 1988; Cheng et al., 2007) and opportunistic insider trading before major corporate events (e.g., Penman, 1985; Seyhun, 1990; John and Lang, 1991; Karpoff and Lee, 1991; Lee et al., 1992; Seyhun and Bradley, 1997; Agrawal and Nasser, 2012; Agrawal and Cooper, 2015; Alldredge and Cicero, 2015).

Given that information on insider trading and takeover rumors is publicly available[20], it is interesting to examine whether the significant insider trading found in firms soon to be taken over can be utilized by market participants as part of an investment strategy. To this end, we form a long-short portfolio based on the abnormal insider trading, which is measured as the level of insider trading during the study period (one year prior to the rumor) minus the level of insider trading during the control period (two years prior to the rumor). The portfolio establishes a long position in rumored takeover targets with positive abnormal insider trading and a short position in rumors with negative abnormal insider trading. Firms are added to the equally-weighted portfolio on the day after the initial publication of the rumor, and are held in the portfolio for a period of either six months or one year using monthly rebalancing.

Table 6 presents the long-short portfolio returns within six months (one year) after the takeover rumor. On average, this trading strategy leads to a monthly significant abnormal return of 0.575 (0.517) within the six-month (one-year) period after the rumor. The long-term persistence of the excess returns suggests that the market does not fully account for insider trading information that is publicly available. It also implies a lack of arbitrage (Shleifer and Vishny, 1997). To investigate

[20] Insider trading statistics are reported to the SEC and are publicly available, but only 2 business days after any event. Therefore, in our analysis for Table 6 we only examine insider trading occurring 2 business days before the rumor date (https://www.sec.gov/fast-answers/answersform345htm.html).

further, we follow Ahern and Sosyura (2015) and divide our sample into above- and below-median subsamples based on (a) Amihud illiquidity (a proxy for the cost of arbitrage; Amihud, 2002) and (b) idiosyncratic volatility (a measure of illiquidity; Shleifer and Vishny, 1997). The results in Table 6 show that illiquid firms drive the long-short portfolios returns, indicating that arbitrage friction prevents the market from acting efficiently.

Insert Table 6 about here

5. ROBUSTNESS

We employ a number of robustness checks to verify our results. First, we use a more restrictive matching procedure, excluding control firms from our sample whose asset size differs from that of our sample firms by more than 50%. Again, we use the three different insider-trading measures as our dependent variables, which we calculate for our sample and control firms over both the study period and the control period. We then rerun the regressions from Table 4, with the results presented in Columns 1 – 3 of Table 7. As indicated by the coefficient of Pre-rumor*Rumored, we again find significant evidence that insiders show an increase in passive before the takeover rumor. Second, we use the Fama-French 17 industry classification instead of Compustat SIC industry codes to match the rumored firms; our finding regarding passive insider trading prior to takeover rumors holds (Columns 4 – 6).

Insert Table 7 about here

Secondly, the difference-in-differences methodology requires that insider-trading trends are not significantly different between rumored and control firms prior to our analysis (Amore and Bennedsen, 2013). To ensure the validity of this parallel trend assumption, we perform two tests. First, we rerun the univariate tests from Table 3 for years t = -4 and t = -3, where year 0 is the year the rumor is published (see Table 8). Similar to Table 3, Columns 1 – 4 of Table 8 display information on mean insider-trading net purchases for rumored and control firms, while Columns 5 - 8 present the p-values for a variety of difference-in-means tests. Column 5 reports p-values for the differences in sample firm net trading between year t=-3 and year t=-4; Column 6 reports p-values for the differences in net trading between the sample firms and the control group during year t=-3; Column 7 reports p-values for the differences in net trading between years t=-3 and t=-4 for control firms; finally, Column 8 reports p-values for the mean differences between Column 5 and Column 7 (that is, the difference in net trading of *sample* firms between years t=-3 and t=-4 minus the difference in net trading of *control* firms between years t=-3 and t=-4). The p-values in Columns 5-8 indicate that there are no significant trends with regard to differences in insider trading between our rumored and control firms.

Insert Table 8 about here

Second, to further investigate the validity of the parallel trend assumption, we present results of a falsification test which estimates our model in a pre-treatment window using years t=-4 and t=-3 in place of years t=-2 and t=-1. The lack of statistical significance for *Year*Rumored* as presented in Table 9 indicates that the parallel trend assumption is justified: both control firms and rumored firms displayed similar insider-trading trends prior to the analysis of our central thesis.

Insert Table 9 about here

The final robustness test involves the Sarbanes-Oxley Act of 2002 (SOX), which is the most recent important change in the regulatory framework governing insider trades. It requires insider trades to be filed on a much more timely basis (as of August 29, 2002). Our takeover rumor sample only includes 18 pre-SOX rumors (i.e., publicized between January 2002 and August 29, 2002). Therefore, our paper should be viewed as a post-SOX study that is not confounded by a mixture of regulatory environments. However, to investigate this issue further, we exclude all 18 takeover rumors from our sample that were published pre-SOX. The results (unreported for brevity) remain qualitatively unchanged.[21]

6. CONCLUSION

This paper examines the open-market transactions of insiders in rumored-takeover target firms using a sample of 1,642 rumored-takeover targets during the period 2002-2011. Insiders are categorized into two mutually exclusive groups based on whether they occupy a managing or non-managing role within the firm. We examine insider-trading net purchases during our study period (a one-year period prior to the initial takeover rumor), simultaneously controlling for both time-series and cross-sectional dimensions using a D-i-D approach.

Our results show that insiders of rumored target firms significantly reduce their purchases during a one-year period before the initial rumor date, as compared to the preceding year. However,

[21] Our results still hold even when we exclude the 140 rumors for which the control period overlaps with the passage of the SOX legislation.

insiders reduce their sales more than they reduce their purchases, leading to an increase in their net purchases. The magnitude of this passive trading strategy is large: the net number of shares and the dollar value of net purchases increase by approximately 58% and 44%, respectively. Furthermore, we find that the observed insider-trading patterns are more significant when (i) the rumor is followed by a formal takeover announcement within one calendar year after the rumor's release, (ii) more extensive justification is provided within the rumor article, and (iii) the trader is a managing (as opposed to non-managing) insider.

Additionally, we find that each of our measures for insider net purchases over the year prior to the initial rumor date significantly predicts rumor accuracy, despite extensive controls. This likely drives our result of profitable returns, absent trading costs, on a strategy in which we 'long' rumored takeover targets having significantly *positive* abnormal insider trading in the year prior while we 'short' rumored takeover targets having significantly *negative* abnormal insider trading in the year prior. Taken together, these findings indicate that there may be some merit in further investigation of investment strategies that incorporate insider-trading behavior as it relates to takeover rumors.

Our findings of widespread passive insider trading in rumored target firms prior to the initial takeover rumor offer regulators evidence that potentially illegal trading related to takeover activity occurs much earlier than the literature currently discusses. If the potentially illegal trading takes the form of refraining from trading (e.g., selling less), then prosecution of such trading may be extremely difficult. Thus, the issue of sanctioning insiders' passive use of material, private information merits further attention.

In addition, our findings may prompt a re-evaluation of why insiders engage in passive versus active insider-trading strategies. We find an absence of active trading within our main sample, a subsample of inaccurate rumors, and a subsample of accurate rumors occurring at least four months

prior to the takeover. As takeovers are typically agreed to within three to five months after the takeover announcement (Sanders and Zdanowicz, 1992; Anilowski et al., 2009), trades thus occur quite far in advance of any potential forced sale as a result of the acquisition. It thus seems unlikely that insiders trading prior to takeover rumors are overly concerned about relinquishing profits on "short-swing" trading transactions (i.e., a purchase and a sale occurring within a period of less than six months).

Alternative trading mechanisms by insiders (such as trading in options) and/or an increased fear of public enforcement prior to high-profile and highly-opportunistic events such as takeover bids may provide an explanation. In support of the former, Augustin et al. (2015) find evidence of increased options trading, attributed to informed traders, within 30 days prior to takeover bids; however, not a single options transaction was found to be conducted by a registered insider. In support of the latter, Guercio et al. (2017) contend that illegal insider trading in the stock market has decreased due to more aggressive enforcement. Further research on this question appears warranted.

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Table 1: Time and industry distributions

Panel A shows the time distribution of 1642 takeover-rumored firms during the period from January 2002 to December 2011. Panel B shows the industry distribution of the sample based on the Fama-French 17 industry classification. For comparison purposes, the industry distribution of active CRSP firms as of December 31, 2011 is also reported.

Panel A: Distribution by year of rumor

Year	Rumor count	% of total count
2002	48	2.92
2003	83	5.05
2004	94	5.72
2005	97	5.91
2006	155	9.44
2007	154	9.38
2008	180	10.96
2009	309	18.82
2010	258	15.71
2011	264	16.08
Total	1,642	100

Panel B: Industry distribution

Fama-French 17 Industry Classification	Rumor count	% of CRSP Population	CRSP Population
Food	55	43%	128
Mining and Minerals	25	17%	146
Oil and Petroleum Products	119	46%	258
Textiles, Apparel & Footwear	32	57%	56
Consumer Durables	24	26%	93
Chemicals	22	29%	76
Drugs, Soap, Perfumes, Tobacco	167	70%	237
Construction and Construction Materials	26	24%	107
Steel Works Etc.	43	83%	52
Fabricated Products	2	7%	29
Machinery and Business Equipment	233	42%	557
Automobiles	22	29%	76
Transportation	47	26%	178
Utilities	3	2%	147
Retail Stores	107	50%	212
Banks, Insurance Companies, and Other Financials	8	0%	2,866
Other	707	44%	1,625
Total	1,642	24%	6,843

Table 2: Descriptive statistics of rumored target and control samples

This table shows descriptive statistics for 1,642 rumored takeover firms and 1,642 matched control firms. Total assets, sales, operating performance, financial leverage, and growth measures are obtained using data from Compustat. The market value of equity as well as measures of stock volatility and prior returns are calculated based on CRSP data. Firm size measures are calculated at the end of the last fiscal year prior to the rumor date. The market value of equity is calculated as the number of common shares outstanding multiplied by the month-end price that corresponds to the end of the fiscal year prior to the rumor date. Firm value is calculated as the sum of the market value of equity and total assets minus the book value of equity.Operating performance for year t, OP(t), is calculated as the operating income before depreciation divided by total assets in the same year. The financial leverage measure is calculated based on the last quarter of the fiscal year prior to the rumor date. The variables relating to stock volatility and prior returns are described in Appendix A. We adjust for the market return using the CRSP equally weighted market index, which includes the NYSE, the AMEX, and the NASDAQ. All dollar values are in inflation-adjusted 2006 dollars.

Firm characteristics							
Measure	**N**	**Mean**			**Median**		
		Rumored	**Control**	**p-value**	**Rumored**	**Control**	**p-value**
Firm size							
Market value of equity ($ mill.)	1,642	7,035	7,298	0.229	1,750	1,508	0.193
Total assets ($ mill.)	1,642	4,537	5,127	0.198	1,275	1,399	0.058
Sales ($ mill.)	1,614	3,885	4,066	0.749	1,017	783	0.937
Operating performance							
OP(−1) (%)	1,377	4.079	5.023	0.073	5.831	5.849	0.269
OP(−2) (%)	1,367	4.354	4.915	0.158	4.977	5.012	0.819
Financial leverage							
Long-term debt/total assets	1,597	0.159	0.147	0.179	0.097	0.116	0.352
Growth							
B/M	1,377	0.632	0.655	0.606	0.343	0.495	0.062
Firm value/total assets	1,597	1.908	1.887	0.163	1.561	1.786	0.452
Sales growth rate (%)	1,296	29.422	27.029	0.283	14.915	14.538	0.618
Stock volatility and prior returns							
σ (%)	1,642	1.150	1.160	0.758	0.974	0.970	0.886
Δσ (%)	1,642	0.059	0.055	0.850	-0.006	-0.009	0.874
PRET(-1)	1,624	0.075	0.074	0.919	0.076	0.077	0.975
PRET(-2)	1,620	0.051	0.052	0.988	0.062	0.062	0.924
PRET(-3)	1,606	0.038	0.040	0.755	0.053	0.055	0.783
PRET(-4)	1,590	0.047	0.049	0.766	0.065	0.066	0.828

Table 3: Univariate tests of insider net purchases

Columns 1 to 4 show the means of three measures of insider net purchases for the 1,642 rumored firms and the matched control firms, during the period of January, 2002 to December, 2011. We define the study period as the one-year period before the date the rumor is published, while the control period is the year prior to that. Insider trading data are obtained from the Thompson Insider Filing Data Feed. Columns 5 to 8 show p-values for a series of univariate t-tests of the difference between means, with the signs of the test statistics given in parentheses. The rumor types in Panels A to E are defined in Appendix A. All dollar values are in inflation-adjusted 2006 dollars.

	Rumored target firms		Control firms		p-values			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: All rumors (n=1,642)	**One year prior**	**Two years prior**	**One year prior**	**Two years prior**	**1-2**	**1-3**	**3-4**	**(1-2)-(3-4)**
Net number of shares bought ('000s)	-61.880	-70.671	-90.247	-79.446	0.000 (+)	0.000 (+)	0.311 (-)	0.001 (+)
Net dollar value of shares bought ($ mill.)	-1.681	-1.900	-2.262	-2.178	0.001 (+)	0.000 (+)	0.897 (-)	0.004 (+)
Net percentage of equity bought	-0.644	-0.729	-0.770	-0.789	0.073 (+)	0.004 (+)	0.844 (+)	0.091 (+)
Panel B: Accurate rumors (n=356)								
Net number of shares bought ('000s)	-48.979	-71.352	-94.535	-82.833	0.008 (+)	0.000 (+)	0.356 (-)	0.077 (+)
Net dollar value of shares bought ($ mill.)	-1.617	-2.194	-2.352	-2.349	0.009 (+)	0.003 (+)	0.992 (-)	0.095 (+)
Net percentage of equity bought	-0.543	-0.695	-0.769	-0.800	0.225 (+)	0.023 (+)	0.774 (+)	0.003 (+)
Panel C: Inaccurate rumors (n=1,286)								
Net number of shares bought ('000s)	-65.452	-70.482	-89.065	-78.508	0.431 (+)	0.296 (+)	0.687 (-)	0.175 (+)
Net dollar value of shares bought ($ mill.)	-1.698	-1.819	-2.237	-2.136	0.128 (+)	0.255 (+)	0.972 (-)	0.271 (+)
Net percentage of equity bought	-0.672	-0.739	-0.770	-0.785	0.447 (+)	0.152 (+)	0.912 (+)	0.294 (+)
Panel D: Informative rumors (n=437)								
Net number of shares bought ('000s)	-58.607	-72.373	-86.569	-78.439	0.043 (+)	0.001 (+)	0.383 (-)	0.034 (+)
Net dollar value of shares bought ($ mill.)	-1.607	-2.192	-2.118	-2.253	0.068 (+)	0.018 (+)	0.731 (+)	0.084 (+)
Net percentage of equity bought	-0.513	-0.659	-0.735	-0.769	0.270 (+)	0.049 (+)	0.547 (+)	0.129 (+)
Panel E: Speculative rumors (n=251)								
Net number of shares bought ('000s)	-70.143	-76.533	-70.672	-79.142	0.227 (+)	0.375 (+)	0.806 (+)	0.385 (-)
Net dollar value of shares bought ($ mill.)	-2.359	-2.685	-2.173	-2.428	0.580 (+)	0.561 (-)	0.615 (+)	0.232 (+)
Net percentage of equity bought	-0.634	-0.719	-0.722	-0.791	0.314 (+)	0.349 (+)	0.352 (+)	0.599 (+)

Table 4: Regressions of insider net purchases

This table presents coefficient estimates from OLS regressions of three measures of insider net purchases against our explanatory variables in Panels A, B, C, and D. Regressions of '# shares', '$ shares', and '% equity' (measuring purchases, rather than net purchases) in Panel E use the single-censored Tobit model. The sample includes 1,352 takeover-rumored firms and their corresponding control firms. Each regression includes four interrelated observations corresponding to each rumored firm: one observation for the rumored firm within the study period and one more within the control period, plus one observation for the control firm within the study period and one within the control period. *Rumored* is a dummy variable equal to one for a rumored firm and zero for a control firm. *Pre-rumor* is a dummy variable equal to one for the study period and zero for the control period. Insider-trading measures are winsorized at the 1% level. Marginal effects (ME) are calculated at the mean values and the % marginal effect equals the percentage of the ratio of ME to the absolute value of the dependent variable. Firm fixed effects (Firm FE) here include the variables *Cashratio, Changesize2y, Concentration, Dormancy, Prevmergers, Priorreturn2y, Resmismatch, Salesgrowth2y, Salesshock, SalesshockSq, and Shareturnover*. Appendix A provides variable definitions. All dollar values are in inflation-adjusted 2006 dollars. p-Values based on clustered standard errors are reported in parantheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Panel A: All insider net purchases	Net number of shares bought ('000s)	Net dollar value of shares bought ($ mill.)	Net percentage of equity bought
ln (Market cap)	-19.559***	-0.936***	0.044
	(0.010)	(0.000)	(0.939)
σ	2869.230**	68.659***	342.174***
	(0.016)	(0.009)	(0.000)
Δσ	276.354	25.267	73.162
	(0.803)	(0.323)	(0.409)
PRET(-1)	-7452.382**	-146.451*	-774.948**
	(0.032)	(0.059)	(0.011)
PRET(-2)	-6616.615**	-74.277	-512.469**
	(0.016)	(0.229)	(0.034)
PRET(-3)	-3616.979*	-34.737	-385.985*
	(0.095)	(0.529)	(0.093)
PRET(-4)	-2489.134	21.588	-240.827
	(0.200)	(0.638)	(0.213)
ROA	-34.300	-0.332	-7.233*
	(0.186)	(0.593)	(0.068)
Book/Market	4.554	-0.060	1.166
	(0.547)	(0.710)	(0.198)
R&D/Sale	-0.004**	-0.000**	-0.000
	(0.047)	(0.032)	(0.120)
Liquidity	-0.865	-0.018	-0.207
	(0.578)	(0.541)	(0.102)
CAR(0,+1)	5.037	0.136	0.197
	(0.620)	(0.606)	(0.884)
Pre-rumor	-10.279	-0.086	0.569
	(0.372)	(0.700)	(0.532)
Rumored	-51.916	-1.360	-7.127
	(0.455)	(0.319)	(0.762)
Pre-rumor*Rumored	46.760***	0.989***	2.822**
	(0.001)	(0.002)	(0.026)
Constant	203.356*	10.762***	-6.044
	(0.060)	(0.000)	(0.469)
Observations	5,408	5,408	5,408
Adjusted R^2	0.029	0.045	0.028
Prob > F	0.000	0.000	0.000
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Mean of dependent variable	-75.561	-2.005	-0.733

Panel B: All insider net purchases (by type of rumor)

	Accurate rumors		
Pre-rumor*Rumored	40.871***	1.017***	2.418**
	(0.005)	(0.009)	(0.032)
	Inaccurate rumors		
Pre-rumor*Rumored	35.663	0.719	3.472
	(0.203)	(0.286)	(0.347)
	Informative rumors		
Pre-rumor*Rumored	38.754***	0.792**	1.988
	(0.008)	(0.047)	(0.192)
	Speculative rumors		
Pre-rumor*Rumored	26.457	1.056	1.701
	(0.406)	(0.233)	(0.635)

Panel C: Insider net purchases; accurate rumors only

	Accurate rumors (-3,-1)		
Pre-rumor*Rumored	37.162**	1.046**	2.507*
	(0.014)	(0.035)	(0.066)
	Accurate rumors (-12,-4)		
Pre-rumor*Rumored	34.851***	1.349**	1.618*
	(0.008)	(0.042)	(0.063)

Panel D: Marginal effect of Pre-rumor*Rumored

	Net # shares		Net $ shares		Net % equity	
	ME	%ME	ME	%ME	ME	%ME
All insiders	40.019***	58.013	0.928**	44.317	2.206**	32.379
	(0.007)		(0.016)		(0.025)	
Managing	15.398**	36.268	0.734***	48.289	1.706***	38.311
insiders	(0.026)		(0.002)		(0.009)	
Non-managing	24.62	92.814	0.117	27.983	2.500	79.138
insiders	(0.210)		(0.601)		(0.166)	

Panel E: Insider purchases only, using Tobit regressions censored from below at zero

	# shares	$ shares	% equity
	All rumors		
Pre-rumor*Rumored	-10.194***	-0.084*	-0.233*
	(0.002)	(0.052)	(0.065)
	Inaccurate rumors		
Pre-rumor*Rumored	-3.724	-0.134	-0.154
	(0.137)	(0.206)	(0.499)
	Accurate rumors (-12,-4)		
Pre-rumor*Rumored	-8.627	-0.239	-0.376
	(0.417)	(0.285)	(0.392)

Table 5: The predictive power of insider trades

This table reports logit regression results in which the dependent variable is a dummy variable equal to one if the rumor leads to a takeover announcement wihin 365 days, while the main independent variables of interest are our measures of abnormal insider trading. The latter are calculated as the level of insider trading during the study period (one year prior to the rumor) minus the level of insider trading during the control period (two years prior to the rumor). Net *# Shares* is calculated as (number of shares bought - number of shares sold). Net *$ Shares* is calculated as (value of shares bought - value of shares sold). Net *% Equity* is calculated as (percentage of equity bought - percentage of equity sold). Firm fixed effects (Firm FE) here include the variables *Cashratio, Changesize2y, Concentration, Dormancy, Infoasym, ln(Market cap), Prevmergers, Priorreturn2y, ROA, Resmismatch, Salesgrowth2y, Salesshock, SalesshockSq, and Shareturnover*. Appendix A provides other variable definitions. All dollar values are in inflation-adjusted 2006 dollars. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Dependent variable: Accuracy (rumored firm is subject to a takeover announcement within 365 days after the rumor)

	1	2	3	4	5	6	7	8	9
Net # Shares ('000s)	0.041***	0.031**	0.037***						
	(0.001)	(0.023)	(0.005)						
Net $ Shares ($ mill.)				0.028***	0.026**	0.027**			
				(0.004)	(0.016)	(0.011)			
Net % Equity							0.331***	0.258**	0.288***
							(0.002)	(0.023)	(0.008)
ValuableBrand	-0.304	-0.620**	-0.641***	-0.328	-0.645**	-0.665***	-0.307	-0.616**	-0.645***
	(0.185)	(0.017)	(0.007)	(0.158)	(0.014)	(0.005)	(0.184)	(0.018)	(0.007)
CAR(-5,-1)	4.780***	3.320***	3.830***	4.682***	3.238***	3.742***	4.780***	3.344***	3.841***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAR(0,+1)	1.235*	0.660	0.839	1.162	0.586	0.772	1.229*	0.647	0.827
	(0.087)	(0.380)	(0.253)	(0.105)	(0.433)	(0.290)	(0.089)	(0.390)	(0.261)
Informative			1.077***			1.073***			1.073***
			(0.000)			(0.000)			(0.000)
Speculative			-0.962***			-0.974***			-0.964***
			(0.003)			(0.002)			(0.003)
AdvisorHired		1.019***			1.024***			1.011***	
		(0.000)			(0.000)			(0.000)	
AnalystReport		-0.188			-0.205			-0.186	
		(0.371)			(0.330)			(0.375)	
BidderDenied		1.166			1.115			1.226*	
		(0.107)			(0.125)			(0.083)	
BidderMentioned		0.439**			0.435**			0.425**	
		(0.018)			(0.019)			(0.022)	
BlockPurchase		0.008			0.027			-0.021	
		(0.985)			(0.949)			(0.959)	
FinancingSource		0.210			0.202			0.204	
		(0.700)			(0.710)			(0.708)	
IndustryActivity		0.446*			0.440*			0.430*	
		(0.062)			(0.066)			(0.073)	
InsiderCited		0.846***			0.842***			0.862***	
		(0.000)			(0.000)			(0.000)	
MgmtConcerns		0.602			0.596			0.616	
		(0.147)			(0.152)			(0.139)	
OptionsIncreased		-0.224			-0.229			-0.210	
		(0.387)			(0.378)			(0.417)	
PEFundInvolved		0.358			0.341			0.368	
		(0.135)			(0.156)			(0.125)	
SynergyCited		1.085***			1.111***			1.082***	
		(0.002)			(0.001)			(0.002)	
TakeoverChatter		-0.346			-0.368			-0.348	
		(0.195)			(0.167)			(0.192)	
TargetDenied		0.294			0.327			0.285	
		(0.741)			(0.714)			(0.750)	
TargetDistress		0.891***			0.880***			0.913***	
		(0.008)			(0.009)			(0.007)	
TargetInitiated		0.176			0.166			0.169	
		(0.522)			(0.547)			(0.539)	
Undervalued		0.369*			0.389*			0.394*	

		(0.078)			(0.062)			(0.059)	
UnusualActivity		0.863*			0.884*			0.840*	
		(0.067)			(0.060)			(0.075)	
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	3.048***	1.210	2.158*	3.057***	1.211	2.164*	2.924***	1.132	2.034*
	(0.006)	(0.318)	(0.056)	(0.006)	(0.318)	(0.055)	(0.009)	(0.352)	(0.074)
Observations	1,477	1,477	1,477	1,477	1,477	1,477	1,477	1,477	1,477
Pseudo R^2	0.126	0.205	0.171	0.126	0.207	0.173	0.126	0.205	0.171
Prob > Chi^2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 6: Long-short portfolio returns

This table shows the monthly returns of long-short portfolios based on abnormal insider trading, which is measured as the level of insider trading during the study period (one year prior to the rumor) minus the level of insider trading during the control period (two years prior to the rumor). The portfolio establishes a long position in rumored takeover targets with positive abnormal insider trading and a short position in rumors with negative abnormal insider trading. Firms are added to the equally-weighted portfolio on the day after the initial publication of the rumor and are held in the portfolio for up to six months (one year) using monthly rebalancing. Returns are calculated using the market model with the CRSP value weighted market return as a benchmark. Following Amihud (2002) and Ahern and Sosyura (2015), Amihud illiquidity is calculated as the average of ($|r_t|/Volume_t$). The proportional bid-ask spread is calculated as 100 ∗ (ask-bid) / M, where M is the midpoint of the bid and ask, using closing prices from CRSP (Betton et al., 2018). For each subsample, *Low* and *High* represent observations relative to the medians. Newey and West (1987) p-values are reported in parentheses. We follow Newey and West (1994) to compute lags. Significance at the 1%, 5%, and 10% level is indicated by ∗∗∗, ∗∗, and ∗, respectively.

Portfolio duration					
	All	Amihud illiquidity		Proportional bid-ask spread	
		Low	High	Low	High
Six months	0.575***	-0.081	0.631***	-0.137	0.685***
	0.001	(0.711)	(0.002)	(0.764)	(0.008)
One year	0.517*	0.104	0.539**	0.655	0.609*
	0.069	(0.532)	(0.013)	(0.621)	(0.082)

Table 7: Regressions of insider net purchases - robustness tests of the matching procedure

Coefficient estimates for a series of OLS regressions of our insider net purchase measures on our explanatory variables. In Columns 1-3, the sample includes 1,246 takeover-rumored firms and their corresponding control firms matched on 3-digit SIC codes and having an asset size within 50% of that of the sample firm. In Columns 4 – 6, we use the Fama-French industry classification instead of Compustat SIC industry codes to match the rumored firms. Our sample size decreases somewhat from 1,642 due to matching considerations as well as incomplete data availability from CRSP and Compustat. Each regression includes four interrelated observations corresponding to each rumored firm: one observation for the rumored firm within the study period and one more within the control period, plus one observation for the control firm within the study period and one within the control period. *Rumored* is a dummy variable equal to one for our sample of rumored firms, and zero for control firms. *Pre-rumor* is a dummy variable equal to one for the study period and zero for the control period. The study period represents the (-12,-1) monthly window, whereas the control period includes the (-24, -13) monthly window, with month 0 representing the rumor publication date. Firm fixed effects (Firm FE) here are the same as in Table 4. Appendix A provides variable definitions. Insider trading measures are winsorized at the 1% level. All dollar values are in inflation-adjusted 2006 dollars. p-Values based on clustered standard errors are reported in parantheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

All insider net purchases						
	(1)	(2)	(3)	(4)	(5)	(6)
	Net number of shares bought ('000s)	Net dollar value of shares bought ($ mill.)	Net percentage of equity bought	Net number of shares bought ('000s)	Net dollar value of shares bought ($ mill.)	Net percentage of equity bought
ln (Market cap)	-21.005***	-0.872***	1.082***	-24.665***	-1.044***	0.332
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.204)
σ	118.450***	-18.019**	-154.507*	963.473**	65.318***	300.595***
	(0.001)	(0.036)	(0.057)	(0.031)	(0.002)	(0.000)
Δσ	-567.059	4.930	-241.130	-1022.788	16.537	-52.473
	(0.883)	(0.962)	(0.557)	(0.243)	(0.470)	(0.575)
PRET(-1)	-4786.961	-93.988	-250.675	-7390.191***	-124.340*	-805.887***
	(0.350)	(0.491)	(0.646)	(0.006)	(0.079)	(0.005)
PRET(-2)	-6054.009	-148.786	-862.791*	-1764.554	91.180*	-184.269
	(0.179)	(0.215)	(0.072)	(0.343)	(0.061)	(0.355)
PRET(-3)	181.811	172.876	596.403	-5592.231**	-77.033	-654.697**
	(0.966)	(0.133)	(0.194)	(0.019)	(0.215)	(0.010)
PRET(-4)	-835.858	32.769	477.091	-1199.991	-24.866	-301.101
	(0.855)	(0.787)	(0.325)	(0.602)	(0.679)	(0.221)
ROA	-46.315	-1.042	-20.391***	-2.702	0.113	-6.326***
	(0.154)	(0.228)	(0.000)	(0.873)	(0.798)	(0.000)
Book/Market	15.690**	0.340*	2.198***	-10.728*	-0.036	0.968
	(0.034)	(0.085)	(0.005)	(0.065)	(0.810)	(0.119)
R&D/Sale	1.437	0.031	0.078	0.016**	0.000	0.002*
	(0.403)	(0.492)	(0.671)	(0.041)	(0.452)	(0.059)
Liquidity	-3.113***	-0.113***	-0.425***	0.178	-0.019**	-0.137***
	(0.000)	(0.000)	(0.000)	(0.617)	(0.036)	(0.000)
CAR(0,+1)	-15.632	-0.258	-0.850	15.781	0.150	2.350**
	(0.502)	(0.678)	(0.731)	(0.155)	(0.603)	(0.047)
Pre-rumor	-13.409	-0.254	-0.739	-6.178	0.083	1.149
	(0.430)	(0.575)	(0.683)	(0.561)	(0.764)	(0.311)
Rumored	27.463	0.655	2.299	-4.949	-0.004	-0.124
	(0.103)	(0.145)	(0.200)	(0.645)	(0.990)	(0.914)
Pre-rumor*Rumored	42.187***	1.131***	2.916**	35.711***	0.725*	2.163*
	(0.001)	(0.007)	(0.048)	(0.001)	(0.064)	(0.078)
Constant	223.778***	10.324***	-18.700***	272.120***	11.684***	-13.402***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Observations	4,984	4,984	4,984	5,392	5,392	5,392
Adjusted R^2	0.067	0.118	0.051	0.047	0.106	0.023
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Mean of dependent variable	-70.444	-2.136	-0.695	-65.149	-3.034	-0.711

Table 8: Univariate tests of insider net purchases for the parallel trend assumption

This table provides the means of three measures of insider net purchases for 1,584 firms that are rumored to be takeover targets, as well as for a corresponding sample of 1,584 matched firms, during the years t=-3 and t=-4, where t=0 is the year the rumor is published. Our sample size decreases somewhat from 1,642 (the original sample size) due to the fact that some of the rumored (control) firms did not exist during years t=-3 and t=-4. Columns 5 to 8 show p-values for a series of univariate t-tests of the difference between means, with the signs of the test statistics given in parentheses. The definitions of the rumor types in Panels B to E are provided in Appendix A. All dollar values are in inflation-adjusted 2006 dollars.

	Rumored target firms		Control firms		p-values			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: All rumors (n=1,584)	**Three years prior**	**Four years prior**	**Three years prior**	**Four years prior**	**1-2**	**1-3**	**3-4**	**(1-2)-(3-4)**
Net number of shares bought ('000s)	-68.216	-72.677	-84.154	-86.936	0.880 (+)	0.162 (+)	0.676 (+)	0.293 (+)
Net dollar value of shares bought ($ mill.)	-1.871	-1.929	-2.405	-2.773	0.389 (+)	0.347 (+)	0.555 (+)	0.611(-)
Net percentage of equity bought	-0.751	-0.789	-0.824	-0.852	0.311 (+)	0.198 (+)	0.716 (+)	0.772 (+)
Panel B: Accurate rumors (n=344)								
Net number of shares bought ('000s)	-69.426	-68.916	-85.162	-85.982	0.161 (-)	0.127 (+)	0.213 (+)	0.347 (-)
Net dollar value of shares bought ($ mill.)	-2.275	-1.952	-2.516	-2.719	0.834 (-)	0.399 (+)	0.259 (+)	0.820 (-)
Net percentage of equity bought	-0.744	-0.719	-0.817	-0.831	0.177 (-)	0.242 (+)	0.723 (+)	0.984 (-)
Panel C: Inaccurate rumors (n=1,240)								
Net number of shares bought ('000s)	-67.881	-73.718	-83.875	-87.200	0.551 (+)	0.133 (+)	0.454 (+)	0.148 (+)
Net dollar value of shares bought ($ mill.)	-1.759	-1.922	-2.374	-2.787	0.203 (+)	0.345 (+)	0.510 (+)	0.887 (-)
Net percentage of equity bought	-0.752	-0.808	-0.825	-0.857	0.655 (+)	0.154 (+)	0.461 (+)	0.853 (+)
Panel D: Informative rumors (n=426)								
Net number of shares bought ('000s)	-65.698	-68.315	-84.948	-85.331	0.517 (+)	0.108 (+)	0.207 (+)	0.209 (+)
Net dollar value of shares bought ($ mill.)	-2.129	-2.308	-2.496	-2.723	0.266 (+)	0.262 (+)	0.282 (+)	0.730 (-)
Net percentage of equity bought	-0.691	-0.725	-0.810	-0.877	0.257 (+)	0.295 (+)	0.218 (+)	0.516 (-)
Panel E: Speculative rumors (n=238)								
Net number of shares bought ('000s)	-82.777	-80.421	-56.944	-57.636	0.637 (-)	0.159 (-)	0.464 (+)	0.145 (-)
Net dollar value of shares bought ($ mill.)	-2.703	-2.622	-1.639	-1.734	0.594 (-)	0.242 (-)	0.377 (+)	0.427 (-)
Net percentage of equity bought	-0.690	-0.651	-0.794	-0.811	0.610 (-)	0.347 (+)	0.521 (+)	0.912 (-)

Table 9: Falsification test

This table presents coefficient estimates for a series of OLS regressions of three measures of insider net purchases against our explanatory variables. The sample includes 1,217 takeover-rumored firms and their corresponding control firms for available data during years t=-4 and t=-3. Each regression includes four interrelated observations corresponding to each rumored firm: two observations for the rumored firm within the years t=-4 and t=-3, plus two observations for the control firm within years -4 and -3. *Year* is a dummy variable equal to one for the year t=-3 and zero for the year t=-4. Since we are estimating regression models several years in advance of the rumor date, we replace CAR(0,+1) with CAR(-41,-1), following Chou et al. (2015). Firm fixed effects (Firm FE) here are the same as in Table 4. Appendix A provides other variable definitions. Insider trading measures are winsorized at the 1% level. All dollar values are in inflation-adjusted 2006 dollars. p-values based on clustered standard errors are reported in parantheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively.

Panel A: All insider net purchases	Net number of shares bought ('000s)	Net dollar value of shares bought ($ mill.)	Net percentage of equity bought
ln (Market cap)	-22.318***	-0.951***	0.451*
	(0.000)	(0.000)	(0.081)
σ	2007.914***	73.219***	372.119***
	(0.001)	(0.000)	(0.000)
Δσ	-173.995	31.016	-7.656
	(0.831)	(0.147)	(0.944)
PRET(-1)	-6371.549***	-96.912	-812.230**
	(0.008)	(0.123)	(0.012)
PRET(-2)	-1864.575	48.301	-284.613
	(0.268)	(0.274)	(0.210)
PRET(-3)	-4897.927**	-30.850	-449.836
	(0.016)	(0.562)	(0.100)
PRET(-4)	-1959.090	-35.226	-182.956
	(0.310)	(0.487)	(0.482)
ROA	-27.897*	-0.430	-12.568***
	(0.064)	(0.276)	(0.000)
Book/Market	3.731	0.181	1.681***
	(0.407)	(0.124)	(0.006)
R&D/Sale	0.016*	0.000	0.002*
	(0.056)	(0.547)	(0.082)
Liquidity	-0.906***	-0.046***	-0.253***
	(0.003)	(0.000)	(0.000)
CAR(-41,-1)	11.429	0.058	1.667
	(0.267)	(0.829)	(0.230)
Year	0.869	-0.093	1.109
	(0.924)	(0.697)	(0.364)
Rumored	11.323	0.610	1.839
	(0.216)	(0.110)	(0.136)
Year*Rumored	11.852	0.445	0.831
	(0.355)	(0.185)	(0.631)
Constant	225.058***	10.401***	-16.057***
	(0.000)	(0.000)	(0.000)
Observations	4,868	4,868	4,868
Adjusted R^2	0.014	0.027	0.019
Prob > F	0.000	0.000	0.000
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Mean of dependent variable	-77.995	-2.244	-0.804

Appendix A: Variable definitions

Potential determinants of insider trading	
σ	Standard deviation of daily stock returns over trading days (-250,-126) relative to the beginning of the control or pre-rumor period (Agrawal and Nasser, 2012)
Δσ	Difference between σ (risk, defined above) and the standard deviation of the daily stock returns over trading days (-125, -1) relative to the beginning of the control or pre-rumor period (Agrawal and Nasser, 2012)
Accurate	Dummy variable that indicates that the rumored target firm became subject to a formal takeover announcement within one calendar year after the initial rumor date (Betton et al., 2018; Ahern and Sosyura, 2015)
Book/Market	The ratio of firm book value to its market value at the end of the fiscal year prior to the control or pre-rumor period (Agrawal and Nasser, 2012)
CAR	Cumulative average abnormal return of the rumor date using the CRSP value-weighted market index
Cashratio	The ratio of cash and marketable securities to marketable assets (Cornett et al., 2011)
Changesize2yrs	The percentage change in the firm's total assets over the previous two years (Cornett et al., 2011)
Concentration	The ratio of sales of the largest four firms to total three-digit SIC industry sales of the target firm (Cornett et al., 2011)
Dormancy	The number of months since the last merger in the same three-digit SIC industry as the target firm (Cornett et al., 2011)
Liquidity	Daily average of the ratio of share trading volume to the number of shares outstanding, computed over the year prior to the control or pre-rumor period (Agrawal and Nasser, 2012)
ln (Market cap)	Natural logarithm of the firm's market capitalization, defined as the number of common shares outstanding multiplied by the closing price on the last trading day during the fiscal year ending before the control or pre-rumor period (Agrawal and Nasser, 2012)
Pre-rumor	Dummy variable that equals one for the study period and zero for the control period (Agrawal and Nasser, 2012)
$PRET_t$	Average daily market-adjusted returns for quarter t before the beginning of the control or pre-rumor period. We adjust for market returns using the CRSP equally weighted market index, which includes the NYSE, the AMEX, and the NASDAQ (Agrawal and Nasser, 2012)
PrevMergers	Count variable of the number of times a firm proposes or receives a merger bid in the prior two years (Cornett et al., 2011)
Priorreturn2yrs	The change in a firm's stock price in the two years prior to a given quarter (Cornett et al., 2011)
R&D/Sale	The ratio of R&D expenses to sales revenue, calculated for the fiscal year prior to the control or pre-rumor period (Agrawal and Nasser, 2012)
ResMismatch	Dummy variable that equals one if either i) sales growth for a firm in the last two years is less than the industry median and the long-term debt ratio is greater than the industry median, or ii) sales growth in the last two years is greater than the industry median and the long-term debt ratio is less than the industry median; otherwise equals zero (Cornett et al., 2011)
ROA	Ratio of net income before extraordinary (or nonrecurring) items to total assets at the end of the fiscal year prior to the control or pre-rumor period (Cornett et al., 2011)
Rumored	Dummy variable that equals one for rumored firms and zero for control firms (Agrawal and Nasser, 2012)
Salesgrowth2yrs	The percentage change in the firm's sales over the previous two years (Cornett et al., 2011)
Salesshock	The absolute value of the difference between the two-year median industry sales growth rate and the two-year median sales growth rate of all sample target firms (Cornett et al., 2011)
SalesshockSquared	The square of sales shock (Cornett et al., 2011)
Shareturnover	The ratio of the number of shares of stock traded for the firm to total shares outstanding (Cornett et al., 2011)
ValuableBrand	An indicator variable representing target firm inclusion in a list of the top 100 brands from the marketing consultancy firms Interbrand and BrandZ anytime between 2002 and 2011 (Ahern and Sosyura, 2015)

Rumor content characteristics (rationales)	
AdvisorHired	Rumor indicates that the target firm has retained the services of an investment bank or financial advisor
AnalystReport	Rumor is the result of one or more analysts reasoning that a takeover seems logical
BidderDenied	Rumor indicates that a potential bidding firm denies that parties are in negotiations
BidderMentioned	Rumor indicates the name of one or more potential bidders
BlockPurchase	Rumor indicates that 5% or more of shares outstanding have recently been purchased by a single entity
FinancingSource	Rumor provides substantial details as to how financing for the deal would occur
IndustryActivity	Rumor indicates that either a competitor is being taken over or that the target industry appears ripe for takeovers
Informative	Rumor based on at least three rumor justifications, excluding those labelled as speculative
InsiderCited	Rumor predicated on an anonymous source
MgmtConcerns	Rumor indicates concerns with the current management
OptionsIncreased	Rumor specifically mentions that an increase in call options is indicative of an impending takeover
PEFundInvolved	Rumor indicates that a private equity or hedge fund has expressed interest in a potential takeover deal
Speculative	Rumor based solely on either takeover chatter or an increase in option activity in the target firm, with no further justification provided
SynergyCited	Rumor indicates that the target firm has specific attributes that would provide unique synergies to an acquirer
TakeoverChatter	Rumor provides very few details, yet mentions that the target firm is subject to ongoing takeover chatter
TargetDenied	Rumor indicates that the target firm denies that parties are in negotiations
TargetDistress	Rumor indicates that the target firm has been experiencing substantial financial and/or operating distress
TargetInitiated	Rumor has been initiated by the target firm itself
Undervalued	Rumor indicates that the target firm may be seen as undervalued, prompting takeover interest
UnusualActivity	Rumor indicates that something unusual has occurred which has led to takeover speculation (e.g., two CEOs simultaneously absent from conference, or other changes in executive team schedules or habits)