

Savvy target insiders' trading before takeover announcements

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Abstract

We contribute to the literature by showing savvy, but not necessarily illegal, insider trading in target firms before takeover public announcements. Our sample covers 1017 deals announced in the US between 2005 and 2011. Our results are threefold. First, we show that target insiders increase their net purchases only once bidders start signing confidentiality agreements, once the deal becomes more certain and insiders possess more and more precise information. Second, insiders are wary of cross-sectional uncertainty. They increase their net purchases only in deals with shorter negotiations and higher completion probability. Third, insider net purchases in the pre-announcement period are in line with insiders guessing well the final offer price, but their trading strategies additionally reflect also their knowledge of deal characteristics. Our results show that insiders savvily complement several sources of information together.

Keywords: Mergers and acquisitions; Insider trading; Target firms
JEL Classification: G34; G14

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1 Introduction

Insider trading on material information has always been a hotly debated topic both in the popular press as well as in academic literature. Insider trading regulation in the US is one of the most restrictive and effective around the world.¹ The fact that public takeover announcements are associated with a strong positive market reaction for target companies is direct evidence of the effectiveness of insider trading restrictions before public releases of material information. In contrast, Bhattacharya et al. (2000) show no unusual returns or return volatility around takeover announcements for target companies in Mexico, arguing that unrestricted insider trading causes prices to fully incorporate the material information before its public release.

The literature provides strong evidence that the restrictive insider trading regulation in the US is effective in prohibiting insider buying before public announcements of takeover deals (Harlow and Howe, 1993; Agrawal and Jaffe, 1995; Agrawal and Nasser, 2012). Insiders possess material information, which is not in the public domain, and therefore buying before investors become aware of the increased chances of takeover premium is illegal. Despite a significant drop in insider buying, target insiders are still able to profit from their private information. Agrawal and Nasser (2012) show that within one year before the takeover announcement insiders stop selling to such an extent that, despite a significant decrease in their buying, their net purchases increase significantly. This passive trading strategy is not necessarily illegal, but is profitable.

Given the restrictive regulatory environment with private material information and results in Agrawal and Nasser (2012) that insiders are still able to execute profitable trading strategies, we are interested in the question of how savvy is the passive trading by target insiders. Does insider trading vary with realized takeover premium? Or do insiders rather trade on their knowledge of deal characteristics that are correlated with the final offer price, but are not directly aware of the future takeover premium? Do they start trading immediately after the deal is initiated or wait until they have more precise information concerning the deal characteristics and deal success? Do insiders trade more for deals with higher expected completion probability? Answers to all these questions are important as they would provide evidence on the information environment

¹Insider trading is regulated by the Securities Exchange Act of 1934. Insider trading on material, non-public information is not allowed by Section 10b and SEC rule 10b-5 and Section 16a requires corporate insiders to report their trades to the SEC. Further, Section 16b of the Securities Exchange Act of 1934 limits round-trip trades within a six-month period. According to this rule, any profits earned by insiders on a round trip within any six-month period are required to be paid back to the firm.

of merger negotiations and reveal how much insiders know and which target firms are in their view worth trading in.

Insiders learn about their firm being ‘in play’ no later than around the initiation date, be it a target or bidder initiated deal.² Target insiders may then adjust their trading in the company stock depending on their own expectation concerning the takeover premium, which is the difference between the insiders’ expected final offer price and the stock price at the moment. The expected takeover premium is however uncertain and subjective. The insiders’ expected takeover premium is most likely affected by insiders’ guesses of the future offer price and deal characteristics, but also by the probability of deal completion. We conjecture that insiders take their information on completion probability, takeover premium and deal characteristics into account when trading in the stock of their own firms. As a result, insiders trade more once bidders start signing confidentiality agreements because the deal uncertainty decreases substantially. When bidders sign confidentiality agreements, insiders are surer about the deal outcomes and have more and more precise information. Insiders will also be more inclined to trade in deals with shorter deal negotiations and higher completion probability.

We analyze open market stock transactions by insiders in 1017 publicly listed US target firms over the period from 2005 to 2011 using hand-collected detailed data concerning the private selling process before takeover public announcements. Similarly to Agrawal and Nasser (2012), we use the difference in differences approach relatively to a control period and matched firms but we use more precise hand-collected data. Our analysis of insider trading in the pre-announcement period results in three main findings. First, we show that insiders are willing to stop selling and, thus, to postpone satisfying their diversification and/or liquidity needs only once bidders start signing confidentiality agreements. Even though insiders are often aware of takeover negotiations since their initiation (on average 387 days before the public announcement), they are confident about their own estimations of the takeover premium only once more serious negotiations are underway, many uncertainties are resolved and completion probability increases markedly. Second, our results show that insiders are cautious and mind cross-sectional uncertainty. Their net purchases increase significantly more in firms with short negotiations and higher completion probability. This cautiousness is quite an important feature of their trading – insiders do not

²For more details concerning the private selling process see Boone and Mulherin (2007).

like keeping stocks with long negotiations or low completion probability even if the final takeover premium is high.

Third, we show that insiders combine various sources of information when trading. Their trading is correlated with the realized takeover premium, which suggests that they have a good grasp of what is coming. Their trading also reveals that they are aware of deal characteristics that increase the final takeover premium: bidder deal initiation, cash payment and selling method involving private negotiations or controlled sales.³ Importantly, however, these deal characteristics further increase insider net purchases when compared to trading based purely on takeover premium. Adding high completion probability together with takeover premium and deal characteristics shows still additional complementary effect. We conclude that insiders combine and complement different sources of information and that they are savvy when trading.

The main contributions of the current paper to the takeover literature are twofold. First, we document the information environment of takeover negotiations. Despite very restrictive insider trading regulations, insiders still manage to employ savvy trading strategies. They trade more only once they have more and more precise information about deal negotiations. Insiders' savvy trading strategies reflect their accurate guess of the final offer price and also show that insiders are aware of the additional contribution of deal characteristics towards a higher takeover premium. Interestingly, insiders avoid uncertainty. They are wary of trading in deals with lengthy negotiations and low completion probability.

Second, we contribute to the takeover literature by showing insiders' profit perceptions concerning deal initiation, method of payment, selling method and the type of buyer. Insider trading before takeover announcements reflects insiders' perceptions of deal value consequences. Masulis and Simsir (2018) argue that target deal initiation is a negative signal of firm quality. Our result that insiders are net buyers in deals that are bidder initiated, but not in target initiated deals provides additional support for the conjecture. We also contribute to the wide discussion on payment consideration. In the pre-announcement period, insiders are surprisingly strong net buyers in cash deals and seem to persistently dislike stock deals. This evidence is in conflict with models suggesting that stock payment is advantageous for target shareholders of undervalued firms (for example Hansen, 1987). It rather suggests that target insiders consider acquirer stock

³Private one-to-one negotiations and controlled sales are defined in Boone and Mulherin (2009). We jointly denote them as 'informal sales.'

as overpriced and prefer to avoid it (Shleifer and Vishny, 2003; Rhodes-Kropf and Robinson, 2008). Further, our results reveal target insiders' preferences for informal sales above full-scale auctions. Bulow and Klemperer (1996) suggest that auctions deliver higher premium than one-to-one negotiations. Insider trading patterns suggest higher profit in informal sales that restrict competition than in competitive full-scale auctions. This result suggests that restricting bidder competition is a deliberate step that is associated with higher expected takeover premium for target shareholders. Our analysis contributes also to the literature on the buyer type, our last deal characteristic (Bargeron et al., 2008; Dittmar et al., 2012). Our results concerning the buyer type are not as straightforward as for the other deal characteristics. Target insiders prefer strategic buyer deals later in the selling process and for less volatile stocks, but they are quite positive also about financial deals, especially early in the selling process. This suggests that insiders prefer not to sell shares when they expect to participate in the management of the company after the deal – in private equity sponsored leveraged buyouts.

Our paper is closely related to Agrawal and Nasser (2012) who examine insider trading in M&A target firms before the public announcement. We adopt their difference in differences approach relatively to matched firms and a control period with more precise coding of the event period based on a hand-collected data set. We carefully code the initiation date and the date of signing the first confidentiality agreement across all deals and, so, we capture the exact timing of when insiders get access to important information concerning the deal.⁴ Moreover, we extend the analysis in Agrawal and Nasser (2012), focusing on the determinants of savvy insider trading and on insiders' information environment.

The remainder of the paper is organized as follows. Section 2 builds our hypotheses concerning savvy insider trading in acquisition targets before takeover announcements. Section 3 introduces the data, explains the coding and the matching process and provides basic statistics. Section 4 shows and discusses the regression results and Section 5 concludes.

⁴The facts that the private selling process (i) is relatively lengthy, (ii) varies widely across deals, and (iii) correlates with deal characteristics, highlights the importance of measuring insider trading from the initiation date when trading on the expected takeover premium becomes an option or from the confidentiality-signing date when the information concerning negotiation outcomes becomes more reliable.

2 Hypotheses

The process of selling a company usually commences when the selling firm contacts interested bidders or is approached by a bidder without any prior solicitation of interest (Boone and Mulherin, 2007). Inevitably, target insiders become aware of the possible future takeover. They establish their expected takeover premium, which is the difference between their expected offer price and the stock price at the moment taking into account the expected completion probability, and they decide on their trading strategies.

Agrawal and Nasser (2012) show that target insiders increase their *net* purchases within one year before takeover announcements due to larger reduction of sales relative to purchases. During the private selling process before the public announcement, target insiders could profit from increasing their purchases due to the high expected takeover premium.⁵ However, insider trading on material information is illegal,⁶ which means that insiders should stop buying immediately as of the deal initiation. Nevertheless, insiders can strategically choose to postpone their sales until the public announcement or even until the completion date without violating any insider trading regulation and still profit on their private information.⁷ Note, however, that postponing insider sales is costly for insiders as they often receive a large part of their remuneration package in the form of stock and stock options and so have high diversification and liquidity needs (Lakonishok and Lee, 2001; Fidrmuc et al., 2006).

Even though the average realized takeover premium is large and positive relative to the stock price eight weeks before the announcement, the insiders' expected takeover premium might be considerably smaller earlier on, at the beginning of the takeover process. It might be lower due to lower completion probability and uncertainty about deal and final buyer characteristics. All the deal-related uncertainties increase with greater time between deal initiation and announcement. As a consequence of relatively low expected takeover premium and high diversification and liq-

⁵Betton et al. (2008) show high significant realized takeover premium for a large sample of US takeovers.

⁶This is due to Section 10b of the Securities Exchange Act of 1934. Moreover, Section 16b of the Securities Exchange Act of 1934 (the short-swing rule), which limits round-trip trades within six months, should further decrease insider purchases, especially in cash deals where insiders have to sell their shares at completion.

⁷Companies typically institute blackout window periods around important corporate events/announcements such as takeovers. The time when they sign confidentiality agreements seems to be very suitable for introducing such a ban on trading. Our summary statistics in Table 2 and in Table I.1 in the internet appendix show that net insider purchases and insider sales remain significantly different from zero during the period from signing confidentiality agreements until the deal announcement. These numbers show significant insider trading activity and suggest nonexistence of selling bans.

uidity needs, target insiders may not change their selling patterns early in the takeover process. They may stop selling only once some uncertainty concerning the takeover premium is resolved, once they have more and more precise information concerning deal completion, deal characteristics and offer price. A significant part of the uncertainty is resolved after interested bidders sign confidentiality agreements. The probability of deal completion goes up and target insiders learn about characteristics of participating bidders which leads to a more precise estimate of the offer price. Even though insiders are aware of takeover negotiations as of the initiation date, they become more certain about deal outcomes once bidders start signing confidentiality agreements. Note that the overall effect on net purchases is fully driven by insider sales. Our first hypothesis differentiates insider trading decisions early versus later in the private selling process:

HYPOTHESIS 1: Target insiders increase their net purchases only once bidders start signing confidentiality agreements.

Whereas our first hypothesis focuses on time-series uncertainty associated with information insiders possess as the selling process progresses, our second hypothesis highlights the cross-sectional uncertainty associated with the length of negotiations and deal completion (Bhagwat et al., 2016). Insiders are less likely to stop selling when the negotiation process is lengthy and therefore more complicated and uncertain. Similarly, they are less likely to stop selling for deals that have lower probability to complete. Insiders are less willing to commit their wealth in trading for more uncertain deals. The second hypothesis summarizes our conjectures:

HYPOTHESIS 2: Target insiders increase their net purchases before the deal announcement in firms with higher completion probability and shorter negotiations.

The main idea behind our hypotheses is that insiders decide about their trading strategies depending on their estimate of the expected takeover premium at the moment of trading. It is likely that insiders have quite a good idea about the final offer price relatively early in the selling process, substantially sooner than the takeover contract is signed and announced. As a result, their trading may be strongly correlated with the realized takeover premium. Alternatively, insiders may base their trading strategies on deal characteristics that are correlated with the offer price: deal initiation, payment consideration, selling method and final buyer type.

The selling process is usually initiated either by a prospective bidder proposing to take

over the firm or by the board of the selling company deciding that they want to consider all alternative strategic options for the future of the company and eventually they offer the firm for sale. Bidder-initiated deals are usually associated with higher realized takeover premium. The literature argues that it is due to higher bidder valuations of targets and higher target firm bargaining power in bidder initiated deals (Masulis and Simsir, 2018; Fidrmuc and Xia, 2018; Aktas et al., 2010; DeBodt et al., 2014).

Deals paid for in cash are associated with higher realized takeover premium (Golubov et al., 2016). Also, the final offer price in cash deals is more certain and fixed, while in stock deals the expected final offer price changes with the acquirer stock price. Acquirers in stock deals usually suffer negative announcement abnormal returns, further reducing the expected takeover premium (Shleifer and Vishny, 2003; Rhodes-Kropf et al., 2005; Golubov et al., 2016). As payment consideration is an important part of the negotiation process, insiders will have a good perception of the likely payment method relatively early in the process.

Target firms are sold either in full-scale auctions, controlled sales or private negotiations (Boone and Mulherin, 2009). We classify the selling method along the dimension of formality and full pre-determination of the process into formal full-scale auctions and informal sales, which include controlled sales and private negotiations.⁸ A formal full-scale auction is associated with a very structured process that follows multiple designed rounds and accommodates a relatively large number of bidders (Hansen, 2001). Controlled sales and private negotiations follow a less formally structured process and involve a restricted number of bidders. In controlled sales, target firms discretely canvass interest from a chosen set of limited number of bidders who then counter-bid each other, while private negotiations involve only one bidder (Boone and Mulherin, 2009). On average, informal sales exhibit higher realized takeover premium relative to formal full-scale auctions even though they involve a smaller number of bidders (Fidrmuc et al., 2012).

Target firms have usually a clear preference for the type of buyer they aim for early on, shortly after deal initiation (Fidrmuc et al., 2012). Targets acquired by strategic buyers versus financial bidders usually exhibit higher realized takeover premium (Bargeron et al., 2008; Dittmar et al., 2012). Considering the realized takeover premium and the four deal characteristics, our third hypothesis is as follows:

⁸Note that our classification differs from the classification in Boone and Mulherin (2007) who contrast private negotiations against ‘auctions,’ which include controlled sales and full-scale auctions.

HYPOTHESIS 3A: Target insiders increase their net purchases before the deal announcement in deals with higher realized takeover premium.

HYPOTHESIS 3B: Target insiders increase their net purchases before the deal announcement in deals that are bidder initiated, paid for in cash, sold through one-to-one negotiations or controlled sales and eventually bought by strategic buyers.

Hypothesis 3 above formulates our main conjecture that insiders trade overwhelmingly due to their expectation of sizeable takeover premium. However, other, alternative effects associated with the deal characteristics may also impact insiders' decisions. The first possible candidate is the uncertainty concerning deal completion highlighted by Agrawal and Nasser (2012). Higher willingness to complete the deal in target-initiated deals increases the deal success probability and thus increases the probability of gaining a positive premium (DeBodt et al., 2014). As a result, it may be target- rather than bidder-initiated firms whose insiders increase their net purchases. Second, the formal selling process of full-scale auctions is fixed and pre-determined and once a selling firm starts the process, it is very likely to end up with a winning bidder committed to the deal. Informal sales, in contrast, are more ad hoc and therefore more uncertain in terms of outcomes. Due to the higher associated certainty, it may be the insiders of firms sold in full-scale auctions who are motivated to increase their net purchases.

Third, Hansen (1987) provides a strong theoretical argument for why insiders in firms paid for by stock might not want to sell their shares. If target insiders believe that their firm is undervalued, they prefer stock payment that allows them to share in the long-term value improvement of the merged firm and long-term synergies created in the deal (Hansen, 1987; Bradley et al., 1988). As a result, insiders in deals paid for in stock increase their net purchases. Finally, buyers in financial deals aim at undervalued firms that have high potential of generating high cash flows and high revenue growth after going private (Dittmar et al., 2012; Gorbenko and Malenko, 2014; Baker et al., 2015). Moreover, private equity firms often keep the target management on board after the buyout (Fidrmuc et al., 2012). Insiders are usually motivated to increase their ownership in the target firm to profit on the value improvement once the firm is private. At the same time, private equity firms support higher insider ownership to align insiders' interests with their own (Wruck, 2008). Therefore, target insiders in financial deals may want to increase their net purchases.

3 Data

3.1 M&A data

The sample includes US M&A deals that were announced between January 2005 and December 2011 and are covered by the Security Database Corporation (SDC) in Thomson ONE Banker. We apply the following four selection criteria: (i) both the acquirers and targets are US companies; (ii) all targets are publicly listed firms before the deal while acquirers could be publicly listed or private firms; (iii) the acquirers own 100% of targets' shares after the deal; (iv) targets have data in COMPUSTAT and CRSP concerning accounting and stock price data. We hand-collect and code information concerning the selling process from the 'background of the deal' section of DEFM14A, PREM14A, SC14D9, or S-4 filings, which we recover from the EDGAR filing collection provided by the SEC.⁹ We hand collect information concerning the initiation type, initiation date and selling method. Out of 2003 deals identified in SDC we are able to find SEC filings on EDGAR for 1260 deals. For a further 103 deals, we are not able to classify the initiator. Finally, we are not able to get data from Compustat or CRSP for 140 targets. Altogether, the data collection results in a sample of 1017 deal targets.

Table 1 reports deal summary statistics. In Panel A, columns 1 and 2 show the number of observations and means for all deals, respectively. The remaining columns show means for short versus long negotiation, high versus low deal completion probability and high versus low premium. Panel B then shows means across deal characteristics – initiation, payment consideration, selling method and type of buyer. We test for differences in means for corresponding pairs using the t-test allowing for unequal variances and report the significance of the test in the second column of the pair. Variable definitions are provided in Appendix A.

- insert Table 1 about here -

Column 2 in Panel A shows that the average transaction value is USD 2.0 billion. On average, it takes 384 calendar days from the moment a deal is initiated to its public announcement. The whole period is split roughly in the middle by confidentiality agreement signing – it takes 162 calendar days from the day the first confidentiality agreement is signed to the deal announcement.

⁹Note that the fact that we condition our data set on having information concerning the selling process means that we include only completed deals. Withdrawn deals do not file this information with the SEC.

The dummy for short negotiation is set based on the median for the negotiation period from signing confidentiality agreements. The deal completion probability as perceived by the market reaction to the deal announcement is 0.71. The final realized premium, relative to the price eight weeks before the public announcement, is 34% for the full sample. The premium increases to 38% when taken relatively to the price at the time when the first confidentiality agreement is signed and is even larger relative to the price at the initiation date at 43%. The offer improvement shows that bidders increase their initial offer by 1%.

Table 1 further shows abnormal stock returns from the initiation date up to the date of signing the first confidentiality agreement and then further up to the public announcement. The target stock price decreases on average by 6.1% (significant at the 1-percent level) between initiation and signing confidentiality agreements and then a further 1.4% until one day before the deal announcement, but the latter return is not statistically significant. The announcement effect for 3 days around the announcement date is large at 26% and significant. The sample deal characteristic frequencies show that 43% of deals are initiated by target firms, 70% are paid for in cash, 33% are sold in full-scale auctions and 25% are acquired by financial buyers.

Columns 3 to 6 in Panel A partition the sample by the negotiation length and deal completion probability. We can see that the completion probability has slightly shorter negotiation length but is uncorrelated with the short negotiation, which suggests that these two variables capture different aspects of the cross-sectional uncertainty of deal completion we are aiming to measure. Short negotiations are associated with larger firms, higher premium and runup since signing confidentiality agreements. Short negotiations exhibit also a lower fraction of target initiation, cash payment, full-scale auctions and financial buyers. High completion probability is associated with higher premium, larger announcement effect and higher fraction of cash payment. High versus low completion probability also have smaller firms and smaller offer improvement. The last two columns partition the sample by premium relative to the stock price at the time of signing confidentiality agreements. The high-premium group includes the top three quintiles.¹⁰ We can see that high- versus low-premium deals have similar size, take a shorter time to negotiate and are more likely to complete. High-premium deals involve a larger offer improvement, runup since signing confidentiality agreement and a larger announcement return. They are more likely

¹⁰We justify the split by quintiles in section 4.

to be bidder initiated, paid in cash and sold in informal sales.

The eight columns in Panel B show partitioning of the sample by firm characteristics. We can see that bidder initiation, stock payment and informal sales are associated with larger firms. We also confirm the findings in the literature that bidder initiation, cash payment, informal sale and strategic buyer are associated with larger takeover premium and exhibit larger announcement abnormal returns. Concerning correlations between the deal characteristics, informal sales are correlated with strategic buyers, stock and bidder initiation and financial buyers pay more often in cash. However, bidder initiation is not correlated with the method of payment or buyer type.

3.2 Insider trading data

The insider trading data is from Thomson Financial Insider Filings Data Table 1, which contains corporate insider non-derivative transactions required to be reported via Form 4 by Section 16 of the Securities Exchange Act of 1934. We have information on the transaction date, transaction price, number of shares traded, person ID, firm ID, company name, resulting shares held and transaction code (purchase or sale). We exclude inaccurate or unreasonable filings¹¹ and transactions labeled as amendments of previous insider transactions¹² (Agrawal and Nasser, 2012). If a transaction price is missing, we replace it with the CRSP closing price on the transaction date. We merge multiple purchases (sales) by the same insider on the same transaction date in the same company. We are interested in analyzing insider purchases and sales separately and, therefore, we keep both purchases and sales transacted on the same day separately. We also compute insider net purchases as purchases minus sales by the same insider on the same transaction date in the same firm (Agrawal and Nasser, 2012).

For the purposes of our analysis, it is very important to compare insider transactions in the pre-announcement period to a non-event period within the same firm. The pre-announcement period lapses between the deal initiation date up to the public announcement date.¹³ Because insider trading varies with the length of the pre-announcement period and across different calendar months, we define the control period exactly over the same calendar months as the pre-announcement period but place it before the initiation date. Then we compare the change in insider trading in target firms relatively to change in insider trading in matched firms that

¹¹They are indicated by the Cleanse Indicator as "A" or "S".

¹²They are indicated by the Amendment Indicator as "A".

¹³Agrawal and Nasser (2012) use a one-year period before the announcement date uniformly across all firms.

do not experience any takeover and remain publicly listed. This is in order to adjust the overall change in target insider trading for the ‘normal’ outcome, that is, the change in insider trading in firms that do not experience any information shock but are similar to the treatment (target) firms and operate over the same period of time. The change in insider trading from the control period to the event period for the matched firms then measures the ‘normal’ effect. We use it to adjust the overall target firms’ effect to get a clean treatment effect that is free of any time trends. This is the essence of the difference in differences approach.

We match based on the industry and total assets just before the initiation date (Shrieves and Stevens, 1979; Agrawal and Nasser, 2012). Our matching procedure is as follows. From the pool of all potential matching firms with available accounting, stock price and insider trading data, we pick the firm that is in the same Fama-French 30 industry and comes the closest in terms of total assets in the same fiscal year using a $\pm 25\%$ range. In case we fail to find a matching firm, we repeat the process for the corresponding Fama-French 12 industry. If we still do not have a match, we apply the 4-digit SIC code industry and then the 3-digit, 2-digit and finally 1-digit SIC code industry. We also require that the same publicly listed firm is not matched repeatedly to different target firms. The targets that are dropped out from our data set due to unavailable SEC filing data are not included as matched firms.¹⁴

We focus on trading by top executives and independent directors. Top executives are the most familiar with the day-to-day operations of their firms and therefore should have the most accurate information concerning their value and prospects (Seyhun, 1986; Fidrmuc et al., 2006). Independent directors should also be informed about the prospects of their firms and they should be quite pivotal in takeover decisions. Combining the two types of insiders creates a well informed and relatively well populated group for our tests. We scale the number of shares traded by the number of shares outstanding and report them in basis points. For each studied period, we aggregate all shares bought (sold) by the top executives and independent directors over the whole period and then divide them by the length of the period in months. We do this re-scaling on a monthly basis because the length of the pre-announcement period (and its corresponding control period) varies across deals and needs to be comparable.

Table 2 reports insider net purchases for the period after and before confidentiality agree-

¹⁴All together, 810 target firms are matched based on FF30 industry, 179 based on FF12, 18 based on 4-digit SIC, 1 based on 3-digit SIC, 4 based on 2-digit SIC and finally 5 targets based on 1-digit SIC.

ments are signed in Panel A and B, respectively. For completeness, we report insider purchases and sales for the same periods in Table I.1 in the internet appendix. Columns 1 and 2 show means for the target firms in the pre-announcement and the control periods. Means for matched firms in the corresponding two periods are reported in columns 3 and 4. The last four columns report differences in means and their significance, including the mean of the difference in differences (DiD mean) in the last column. We show statistics for all deals and then across seven partitions: negotiation length, completion probability, premium, deal initiation, selling method, payment consideration and buyer type. Insider net purchases are reported as a fraction of shares outstanding in basis points per month. We winsorize all insider trading variables at the 5th and 95th percentiles due to a handful of large outliers which cause a large standard deviation.¹⁵

- insert Table 2 about here -

Panel A shows insider net purchases immediately before the public announcement after bidders start signing confidentiality agreements. For all deals together, target insiders significantly increase their net purchases in the pre-announcement period relative to the control period and matched firms and the DiD mean in the last column is also positive and significant at the five-percent level. Concerning the seven partitions, target insiders increase their net purchases significantly only in the partitions that are in line with Hypothesis 2 and 3. Panel B shows insider trading in the early pre-announcement period. For all deals together, target insiders significantly increase their net purchases relatively to the control period but the DiD mean in the last column is insignificant. Concerning the seven partitions, the last column shows that the DiD mean is significant only for long negotiation, high completion probability and cash payment.

Also note that the net insider purchases in the target firms in the pre-announcement period in column 1 are significantly different from zero in both panels across all partitions. The negative significant means in Panel A show that even though insiders stop selling, they do not stop selling completely. Insiders across the board are still selling their company shares. This shows that target companies do not ban insider sales during takeover negotiations and our results are not driven by restrictions on trading rather than insiders' decision to sell or not. Table I.1 in the internet appendix reports significance of means directly for insider purchases and sales

¹⁵For net purchases, winsorizing at the 5th and 95th percentiles instead of 1st and 99th percentiles is associated with halving of the standard deviation from 9.8 basis points to 4.5 basis points.

and confirms that insider sales during the period since signing confidentiality agreements are significantly different from zero.

4 Results

Tables 4 to 9 report our regression results for insider trading patterns in target firms before the public announcement. In all specifications, insider transactions by top executives and independent directors are measured as a fraction of common equity in basis points and all are re-adjusted on a monthly basis. We believe that scaling the number of shares traded by all shares outstanding provides the best insider trading measure as it reflects both the trading volume as well as firm size. All regressions include the following control variables: natural log of market capitalization, book to market ratio, volatility of daily stock returns, change in volatility of daily stock returns, insider ownership, R&D over total sales, liquidity, pre-announcement period length, time and industry dummies. Coefficients for control variables are not reported in the tables to preserve space, but are available on request. The estimated values are consistent with the literature (Seyhun, 1986; Aboody and Lev, 2000; Lakonishok and Lee, 2001; Agrawal and Nasser, 2012). Summary statistics for the control variables are reported in Appendix B.

Due to the difference in differences set up, our main variable of interest is the interaction term ‘target x pre-announcement.’ We refer to the interaction term coefficient as the difference in differences (DiD) coefficient. The two plain dummy variables are also included as regressors. All regressions are estimated using OLS. Because the magnitude of the interaction effect in nonlinear models does not equal the marginal effect of the interaction term (Ai and Norton, 2003), we shy away from tobit models for insider purchases and sales. Following Norton et al. (2004), we use simple OLS regressions that do not suffer the interaction term problem. We report Hubert/White robust standard errors in brackets. In Table 3, we check that insider trading in target versus matched firms follows similar patterns before our studied pre-announcement event period. This is an important assumption behind the difference in differences approach. Table 3 reports means for insider purchases, sales and net purchases for both target and matched firms during the whole control period, but also during an earlier and later part of the control period and the corresponding change. We also report the differences between target and matched firms. We can see that only one of the change means is significantly different from zero and,

more importantly, all differences between target and matched firms are insignificant. We can conclude that insider trading in our target firms follows similar patterns to insider trading in the matched firm absent the event of target negotiations.

- insert Table 3 about here -

4.1 Intensity and timing of insider trades

Table 4 tests Hypothesis 1 that insiders adjust their net purchases only once confidentiality agreements are signed. We partition the pre-announcement period into two subperiods – after and before signing the first confidentiality agreement with a bidder and report the results for these two subperiods in Panel A and Panel B, respectively. Panel C reports results for the whole pre-announcement period, starting at the initiation date. Insider purchases are reported in column 1, sales in column 2 and net purchases in column 3. Signing a confidentiality agreement is an indication of interest and commitment from a bidder and, therefore, is likely to decrease deal uncertainty. A deal becomes tangible and realistic and the expected premium increases. Column 1 in Panel A shows that insiders decrease their purchases significantly in the period after signing confidentiality agreements: the DiD coefficient is negative and significant on the one-percent level. Column 2 shows that insiders also stop selling. In fact, target insiders stop selling to such an extent that the DiD coefficient for net purchases in column 3 is also significantly positive, supporting Hypothesis 1. Resolution of (part of) uncertainty by signing confidentiality agreements with potential bidders means that target insiders are better able to assess deal outcomes and to decide that it is worth it to stop selling. The economic significance of the effect is also large: insiders increase their net purchases by 0.63 basis points per month relative to both the control period and matched firms. Note that the unconditional average monthly net purchases in target firms are -2.43 basis points.

- insert Table 4 about here -

Panel B shows results for insider trading between deal initiation and signing of confidentiality agreements. The DiD coefficient for purchases in column 1 is negative and significant at the 5-percent level showing that insider purchases drop immediately after deal initiation when uncertainty about deal completion and about expected takeover premium is still quite high. Even though deal initiation takes place a long time before deal announcement (on average 384

calendar days), insiders feel constrained by legal jeopardy and stop buying immediately. At the same time, the DiD coefficient of -0.10 is markedly smaller than the DiD coefficient of -0.22 in Panel A for the period after confidentiality agreements are signed. The DiD coefficient in column 2 for insider sales shows that target insiders decrease also their sales, but not significantly. Uncertainty concerning the expected premium before first bidders start signing confidentiality agreements is too high and insiders are not willing to postpone their sales yet. Overall, target insiders do not change their net purchases early during takeover negotiations: the DiD coefficient in column 3 is not significantly different from zero. The results in Panels A and B are consistent with Hypothesis 1.

We have 26 and 94 deals which have a confidentiality agreement date coinciding with the announcement and initiation date, respectively. To address the concern that these deals may be biasing our conclusions, Table I.2 in the internet appendix shows results when we exclude these 26 and 94 deals from the analysis in Panel A and B, respectively. Conclusions from Table 4 still follow through.

Panel C reports insider trading effects during the whole pre-announcement period as off the deal initiation until the public announcement. Column 1 for insider purchases confirms, in line with the results in Panels A and B, that insiders stop buying during the whole pre-announcement period. The DiD coefficient for insider sales in column 2 is also significant at the 5-percent level, which then results in a significant DiD coefficient for net purchases in column 3. Even though target insiders do not increase net purchases before their firms sign confidentiality agreements (Panel B), the net-purchase effect is significant when considering the whole sale negotiation process as of deal initiation. The strong effect in the period after signing confidentiality agreements prevails.

4.2 The effect of completion probability

Table 5 explores Hypothesis 2 that insiders adjust their trading patterns based on the cross-sectional uncertainty, which we measure as the completion probability and negotiation length. Columns 1 and 2 partition the sample into short versus long negotiations and columns 3 and 4 into high versus low completion probability. Both variables are split by the median values. We report only results for net purchases as insider purchases and sales always follow a pattern as in

Table 4.¹⁶ To increase the readability of reported results further, for each regression we show only the DiD coefficient for the interaction term ‘target x pre-announcement’ even though all regressions include also the two plain dummy variables and all other control variables. We also refrain from showing Panel C with results for the whole pre-announcement period as it is not very informative.

- insert Table 5 about here -

In Panel A, covering the period since signing confidentiality agreements, the DiD coefficients for deals with short negotiation in column 1 and high completion probability in column 3 are high in magnitude and significant while the high uncertainty DiD coefficients (in columns 2 and 4) are low and insignificant. These results support Hypothesis 2 that insiders prefer keeping stocks with high completion probability and short negotiations. Insiders avoid high uncertainty stocks. The magnitude of the increase in net purchases for low uncertainty deals is markedly larger than for the pooled effect in Table 4: 0.86 and 0.95 basis points relatively to 0.63 basis points for the pooled sample. Panel B shows that the effect of cross-sectional uncertainty is somewhat weaker in the early negotiation period before confidentiality agreements are signed.

Table I.3 in the internet appendix shows that insider net purchases are sensitive to both the length of the negotiation period from signing confidentiality agreements to the public announcement and also to the length of the negotiation period from the deal initiation to signing confidentiality agreements. Indeed, insider net purchases are the highest when both parts of the negotiation process are shorter.

4.3 The effects of realized premium and deal characteristics

Tables 6 and 7 test Hypothesis 3 which focuses on the future realized takeover premium and deal characteristics as determinants of insider net purchases. In order to explore whether insiders trade depending on their intuition for high realized premium, columns 1 and 2 in Table 6 partition the sample into deals with higher-than-median versus lower-than-median premium, respectively. The partitions are based on the premium relative to the stock price when signing confidentiality agreements. We find that both DiD coefficients are positive but insignificant, which contradicts

¹⁶The DiD coefficient for purchases is (with a few exceptions) significantly negative for all tested groups. The overall effect for net purchases is driven fully by the pattern for insider sales – if net purchases increase significantly, it is because sales decrease significantly.

Hypothesis 3A. The realized takeover premium seems not to matter for insider net purchases. To investigate further, columns 3 to 5 explore the pattern across premium quintiles. Interestingly, we can see that insiders are not very keen to increase their net purchases in the highest and lowest quintiles, but they increase their net purchases significantly in premium quintiles three and four. The DiD coefficient estimate for quintiles three and four is 1.02 basis points and is large in magnitude relatively to the pooled effect of 0.63 in Table 4. The increase in net purchases is concentrated in these two quintiles. Given, we report premium partitions based on the highest three versus lowest two quintiles in Tables 1 and 2, columns 6 and 7 show regression results for this partition as well. Pooling the highest three quintiles leads to a still significant and positive DiD coefficient of 0.75.

- insert Table 6 about here -

Altogether, the results in Table 6 suggest that Hypothesis 3A is partially supported – insiders prefer trading when the realized premium is higher, but they avoid deals with very high premium. We explore this issue further in section 4.4. Panel B shows that this pattern of insider trading is not present before the first confidentiality agreement is signed: insiders do not consider (their guess concerning) the premium when trading before they have more precise information about the prospects of the deal.

Table 7 partitions the sample by the four deal characteristics. Panel A shows that insiders increase their net purchases significantly in bidder-initiated deals (column 1), cash deals (column 3), informal sales (column 5) and strategic deals (column 7). The increase is the largest at 0.95 basis points for informal sales and the smallest at 0.60 basis points for strategic deals. The DiD coefficients for the counter-part types – target-initiated deals, stock deals, auctions and financial deals – are not significant. These patterns across partitions by deal characteristics are in line with differences in the realized premium and support Hypothesis 3B. Panel B with net insider purchases before confidentiality agreements are signed shows weaker results. The increase in net purchases is significant only for cash payment, but the DiD coefficient of 0.70 basis points is smaller than 0.88 basis points in Panel A. Relatively large uncertainty concerning deal outcomes discourages insiders to stop selling in bidder-initiated deals and informal sales. Interestingly, we see a large increase in net purchases for financial deals, but the coefficient is not statistically significant at conventional levels.

- insert Table 7 about here -

Table 8 explores the question of which of the two insider trading determinants, future premium or deal characteristics, is more important. Are insiders really able to guess the takeover premium well or do they just use information concerning deal characteristics to form their expectations? To explore this question, we partition the sample into two groups by each deal characteristic across the three premium groups. Again, Panel A focusses on the period after signing confidentiality agreements when insiders are more confident about their deal completion. We can see that for all deal characteristics, except the buyer type, only one of the six cross-partitions has a significant DiD coefficient – the group for premium in quintiles three and four and the dominant deal characteristic (bidder initiation, cash payment and informal sale). All these DiD coefficients are large – between 1.34 and 1.42, which represents a further sizeable increase in net purchases compared to the coefficients in Tables 6 and 7. These sizeable coefficients suggest complementarity between the two sources of information. Including both relatively high premium and bidder initiation (or cash payment, or informal sale) is associated with a larger increase in net purchases than each of the determinants on its own. Insiders do not rely only on deal characteristics when increasing their net purchases, they possess more information (intuition) concerning the final offer price. The DiD coefficients for the type of buyer are insignificant across all three premium groups – the increase in net purchases is not concentrated in any of the cross-partitions. We conclude that the buyer type is not a clear-cut determinant of insider net purchases. Premium may be higher for strategic deals, but insiders often participate in management of successful financial deals (private equity supported leveraged buyouts) and, therefore, insiders may prefer holding on to their shares before the deal is announced and stock prices increase. Panel B of Table 8 covers the period before confidentiality agreements are signed. We do not see any significant results.

- insert Table 8 about here -

To summarize, our results in this section partially support Hypothesis 3A and fully support Hypothesis 3B. Insiders use both their intuition for the realized premium as well as deal characteristics when increasing their net purchases before their deal announcements. However, insiders seem to avoid deals with very high takeover premium. Moreover, we find a complementarity

effect between premium and three of the deal characteristics – bidder initiation, cash payment and selling method. The buyer type (strategic versus financial buyer) is not complementary with the takeover premium, which suggests other sources of value for insiders in financial deals.

4.4 Complementarity between uncertainty and premium

Given we find a support for both Hypothesis 2 and Hypothesis 3, Table 9 explores the relative importance of cross-sectional uncertainty versus premium and deal characteristics as determinants of net insider purchases. In columns 1 to 4, we first combine short versus long negotiations with the three premium partitions and then with partitions across each of the four deal characteristics. Similarly, columns 5 to 8 combine high versus low completion probability first with the three premium partitions and then with partitions across the four deal characteristics.

In Panel A for the period after signing confidentiality agreements, the two DiD coefficients when combining low uncertainty with premium in quintiles three and four (columns 2 and 6 in the first line of DiD coefficients) are large in magnitude and statistically significant, while all the other DiD coefficients in the first two rows are relatively small and statistically insignificant. The economic effect of the two significant DiD coefficients is high – insiders increase their net purchases by 1.29 to 1.32 basis points per month in quintiles three and four (columns 2 and 6) versus 0.77 and 0.80 in quintile five (columns 1 and 5). When cross-sectional uncertainty is low the high insider net buying is concentrated in premium quintiles three and four and not in the highest premium quintile five. With low uncertainty, insiders are happy with slightly lower premium. Or put differently, given insiders have a strong preference for less uncertainty, they also avoid deals with very high premium. The size of the takeover premium does not affect net insider purchases in firms with high uncertainty – the coefficients in columns 3, 4, 7 and 8 are all insignificant. This pattern between uncertainty and premium provides an explanation for the weak DiD coefficient for the highest premium quintile in Table 6. Insiders dislike uncertainty, which makes them avoid deals with very high realized premium. They prefer betting on deals with higher completion probability or shorter negotiations but somewhat lower premium.

- insert Table 9 about here -

The remaining results in Table 9 show a clear pattern of complementarity between uncertainty and the deal characteristics. Except the DiD coefficients for strategic buyer, all the DiD

coefficients for low uncertainty combined with the dominant deal characteristic are large in magnitude and statistically significant. The coefficient estimate is the highest at 1.31 basis points per month for informal sales when low uncertainty is measured as short negotiation length. The results for the buyer type are again the weakest, which confirms our previous conclusion that the buyer type is not a clear-cut determinant of insider trading behavior. All the remaining DiD coefficients in Panel A are smaller in magnitude and statistically insignificant (except the DiD coefficient for low completion probability and informal sales). These results show again that insiders combine/complement different sources of information when trading and suggest their savvy nature.¹⁷

The partitions in Panel B for the period before signing confidentiality agreements show that some DiD coefficients are statistically significant, but the patterns are weaker relative to Panel A. We confirm our previous conclusions that insiders concentrate their trading on the later period closer to the announcement with more precise information. Nevertheless, cash payment and informal sale together with short negotiation or high probability of completion are associated with significant insider net purchases even before signing confidentiality agreements. In contrast, premium in the lowest two quintiles and long negotiations is associated with significant decrease in insider net purchases in this early negotiation period.

To summarize, the results in Table 9 suggest that including low uncertainty in combination with premium or deal characteristics as a determinant of insider net purchases increases the size of the DiD coefficients markedly. We can see that insiders prefer keeping stock with low uncertainty when they are sold in informal sales, for cash or are bidder initiated. Insiders also like low uncertainty together with higher realized takeover premium. Due to high associated uncertainty, insiders avoid deals with very high realized premium. The individual sources of information are complementary.

5 Conclusions

The main aim of this paper is to analyze savvy insider trading in target firms before takeover public announcements. We analyze the determinants of increases in net insider purchases in

¹⁷Table I.4 in the internet appendix combines all information (uncertainty, premium and deal characteristics) together. All the results are in line with what we have discussed so far and we do not get any additional insights. Also, numbers of observations in some groups become very small, so we should be careful in pushing these results too far.

the pre-announcement period since deal initiation. The main contribution of such an analysis is to characterize the insiders' information environment during deal negotiations and insiders' expectations concerning deal success and outcomes.

We examine insider trading patterns on a sample of 1017 publicly listed US target firms using the difference in differences approach that controls insider trading in the same firm during a control period and, at the same time, for change in insider trading in matched firms. In line with the literature, target insiders decrease their purchases before the public announcement (Harlow and Howe, 1993; Agrawal et al., 1992; Agrawal and Nasser, 2012). We show that higher legal jeopardy motivates insiders to decrease their purchases immediately after deal initiation, but the decrease becomes larger as the deal public announcement becomes more imminent and insiders gain access to more precise information. At the same time, we find a significantly large drop in insider sales only once bidders start signing confidentiality agreements, suggesting that insiders' information concerning the future deal becomes more precise and reliable and insiders are willing to postpone their diversification and/or liquidity needs. Insiders do not stop selling significantly before bidders start signing confidentiality agreements. Early in the negotiation process, insiders' uncertainty concerning the expected premium is high and causes the insiders' trade-off to tilt in favor of their diversification and liquidity needs – they do not stop selling yet. Combining the effects for insider purchases together with their sales, we find that insider net purchases increase significantly in the later pre-announcement period after confidentiality agreements are signed.

Exploring cross-sectional determinants of savvy insider trading, our results are threefold. First, we find that insiders prefer buying in firms with low cross-sectional uncertainty, where their precision of estimating the takeover premium is higher. Second, we show that insiders increase their net purchases when the realized takeover premium is relatively high, which suggests that insiders have good knowledge (intuition) of the offer price some time before contracts are signed. At the same time, insiders avoid deals with very high realized premium. Our analysis shows that this is due to insiders' preferences for deals with low uncertainty – short negotiation period and high completion probability. Insider net purchases are also significantly larger for deals with characteristics that are usually associated with higher takeover premium – bidder deal initiation, cash payment, informal sale with restricted bidding competition and strategic buyer.

Our results also suggest that takeover premium is not the only consideration for wanting to keep stock eventually bought by strategic versus financial buyer. Following successful deals, insiders often participate in the management of private equity supported leveraged buyouts, which means that they may want to keep their shares before the deal is announced and stock prices increase. Third, we find that insiders savvily combine all available information when trading. Their net purchases increase the most for deals for which all the trading determinants overlap: deals with low cross-sectional uncertainty, relatively higher premium and deal characteristics. Each of the determinants contributes marginally to the increase in insider net purchases.

In summary, we show that insiders use their private information strategically as they trade differently across deals with different deal and firm characteristics. Their savvy trading is sensitive to insider trading legal restrictions as they stop selling rather than increase buying and it seems that insider trading patterns do not provide much information to outside investors for detecting increased probability of forthcoming deals.

Appendix A Variable definitions

HC stands for ‘hand collection,’ OC for ‘own calculations’ and TIF for ‘Thomson Financial Insider Filings.’

Variable	Definition	Source
Auction	Dummy variable equal to 1 in case the company is sold in a highly organized auction with pre-set rules and 0 otherwise. Based on Hansen (2001).	HC
Bidder initiated	Dummy variable equal to 1 for deals for which a potential buyer approaches the target firm and proposes an M&A transaction (includes both final acquirer initiated and third party initiated deals) and 0 otherwise.	HC
Book to market ratio	Book value of equity over market capitalization one fiscal year before the beginning of the pre-announcement or control period.	COMPUSTAT
$CAR_{-1,+1}$	The target cumulative abnormal stock return from one day before to one day after the SDC announcement date.	CRSP, OC
$CAR_{init.,1db.conf.agr.}$	The target cumulative abnormal stock return from the initiation date to the date when the first confidentiality agreement with a bidder is signed.	CRSP, OC
$CAR_{conf.agr.,1db.ann.}$	The target cumulative abnormal stock return from the date when the first confidentiality agreement is signed with a bidder to one day before the SDC announcement date.	CRSP, OC
Confidentiality agreement length	The number of calendar days from the date when the target firm signs the first confidentiality agreement with a bidder to the SDC announcement date.	OC
Cash (payment)	Dummy variable equal to 1 in case the acquirer offers only cash as the payment consideration and 0 otherwise.	SDC
Change in volatility of returns	The change in volatility of daily stock returns over the period from 125 to 1 trading day versus the period from 250 to 126 trading days before the beginning of the pre-announcement and control period, respectively. Based on Agrawal and Nasser (2012).	CRSP, OC
Deal completion probability	Target stock price at the end of the announcement day over takeover final offer price, both adjusted by the target stock price eight weeks before the deal announcement; following Samuelson and Rosenthal (1986): $\frac{P_{+1}-P_{-42}}{P_{offer}-P_{-42}}$	SDC
Financial buyer	Dummy variable equal to 1 in case the target firm is acquired by a firm that is majority owned by a private equity investor and 0 otherwise. Based on Fidrmuc et al. (2012).	SDC
High compl. probability	Dummy variable equal to 1 in case the deal completion probability is above the sample median and 0 otherwise.	SDC
High premium	Dummy variable equal to 1 in case the premium to confidentiality agreement is in the top three quintiles and 0 otherwise.	SDC, OC
Informal sale	Dummy variable equal to 1 in case the target firm is sold in a controlled sale or one-to-one negotiation and 0 otherwise. Based on Boone and Mulherin (2009).	HC
Initiation date	The date on which the target starts to consider a potential sale of the firm. Based on Boone and Mulherin (2007).	HC
Insider ownership	The total fraction of shares outstanding owned together by the board members and top officers just before the pre-announcement or control period.	TIF, OC
Liquidity	Daily average fraction of shares outstanding that is traded over one calendar year before the beginning of the pre-announcement or control period.	CRSP, OC
Long negotiation	Dummy variable equal to 1 in case the confidentiality agreement length is larger than the median value and 0 otherwise.	HC, OC
Low compl. probability	Dummy variable equal to 1 in case the deal completion probability is below the sample median and 0 otherwise.	SDC
Low premium	Dummy variable equal to 1 in case the premium to confidentiality agreement is in the bottom two quintiles and 0 otherwise.	SDC, OC

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Variable	Definition	Source
Market capitalization	Stock price times the number of shares outstanding one fiscal year before the beginning of the pre-announcement or control period; in the analysis used as a natural logarithm.	CRSP
Net purchases	Purchases minus sales by all board members and top officers over a given trading period in a given target company. Based on Agrawal and Nasser (2012).	TIF, OC
Offer improvement	The final offer price at the completion date relatively to the initial offer price at the initiation date in percentage points.	SDC
Period after signing confidentiality agreement	The period from signing the first confidentiality agreement with a bidder to the public announcement.	OC
Period before signing confidentiality agreement	The period from the initiation date to the date of signing the first confidentiality agreement with a bidder.	OC
Pre-announcement	In Tables 4–8, dummy variable equal to 1 for the period from the signing of the first confidentiality agreement to the SDC announcement date in Panel A, for the period from the initiation to the signing of the first confidentiality agreement in Panel B and for the period from the initiation to the SDC announcement date and 0 for the control period.	TIF, OC
Premium	The final offer price relatively to the stock price eight weeks before the SDC announcement date in percentage points.	SDC
Premium to confidentiality agreement	The final offer price relatively to the stock price at the date when the first confidentiality agreement with a bidder is signed in percentage points.	SDC, OC
Premium to initiation	The final offer price relatively to the stock price at the initiation date in percentage points.	SDC, OC
Premium to 1 day before announcement	The final offer price relatively to the stock price 1 day before the SDC announcement date in percentage points.	SDC, OC
Private selling process length	The number of calendar days from the initiation date to the SDC announcement date, in regressions used as a natural logarithm.	HC
R&D	Research and development expenses divided by total sales.	COMPUSTAT
Short negotiation	Dummy variable equal to 1 in case the confidentiality agreement length is smaller than the median value and 0 otherwise.	HC, OC
Stock (payment)	Dummy variable equal to 1 in case the payment consideration involves stock of the acquirer company and 0 otherwise.	SDC
Strategic buyer	Dummy variable equal to 1 in case the target firm is eventually acquired by a private or public non-financial firm. Based on Fidrmuc et al. (2012) and Gorbenko and Manlenko (2014).	SDC
Target	Dummy variable equal to 1 for target firms and 0 for matched firms.	OC
Target initiated	Dummy variable equal to 1 in case the board of the target firm decides to consider strategic alternatives for the future of the company and consequently contacts potential buyers.	HC
Top executives and independent directors	Corporate insider group that includes the board members and top officers (CB, CEO, CO, GC, P; AC, AF, CC, CFO, CI, CT, D, DO, EC, FC, GP, H, M, MC, MD, O, OB, OD, OP, OS, OT, OX, S, SC, TR, VC, AV).	TIF, OC
Total assets	Book value of total assets in USD millions; in the analysis used as a natural log.	COMPUSTAT
Transaction value	Total value paid by the acquirer less fees and expenses in USD millions.	SDC

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Variable	Definition	Source
Volatility of returns	The volatility of daily stock returns over the period from 250 to 126 trading days before the beginning of the pre-announcement and control period, respectively. Based on Agrawal and Nasser (2012).	CRSP, OC
Whole pre-announcement period	The period from the initiation date to the public announcement of the deal.	OC

Appendix B Summary statistics for control variables in the difference in differences regressions

This table presents summary statistics for control variables included in Tables 4 to 9 for 1017 target and 1017 publicly listed matched firms. For brevity, we report only statistics for the pre-announcement period. The private selling process length is a deal characteristic and by construction matched firms do not have any values. We fill in the missing observations with the corresponding deal values because the private selling process length is still an important regressor in the cross-section of firms. All variables are defined in Appendix A and winsorized at the 1st and 99th percentiles. In the last column, we test for differences in means using the *t*-test allowing for unequal variances. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent level.

	Deal firms		Matched firms		Mean difference
	Mean	St. dev	Mean	St.dev	
Total assets (million USD)	1,871	4,913	2,034	5,335	-162
Log of total assets	6.014	1.725	5.990	1.837	0.025
Market capitalization (USD millions)	1,191	2,864	1,557	3,540	-366 ^b
Log of market capitalization	5.595	1.888	5.802	1.848	-0.207 ^b
Book to market ratio	0.599	0.581	0.561	0.528	0.038
Insider ownership	0.081	0.152	0.081	0.146	0.000
R&D over sales	0.226	1.044	0.266	1.121	-0.040
Liquidity	0.007	0.007	0.007	0.007	0.0004
Private selling process length	384	378	384	378	n.a.

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Table 1: Deal summary statistics

This table shows summary statistics for all deals (column 2) and separately for short versus long negotiations (columns 3 and 4), high versus low completion probability (columns 5 and 6) and high versus low premium (columns 7 and 8) in Panel A and for bidder versus target initiated deals (columns 1 and 2), cash versus stock payment (columns 3 and 4), informal sales versus full-scale auctions (columns 5 and 6), and strategic versus financial buyers (Columns 7 and 8) in Panel B. All variables are defined in Appendix A and winsorized at the 1st and 99th percentiles except all dummy variables. We test for differences in means using the *t*-test allowing for unequal variances. The significance of differences in means within partitions is indicated always in the column for the second partition. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent levels.

Variable	(1) # obs.	(2) All deals	(3) Short negotiation	(4) Long negotiation	(5) High completion probability	(6) Low completion probability	(7) High premium	(8) Low premium
<i>Panel A</i>								
Transaction value(million USD)	1,006	1,958 ^a	2,766	1,101 ^a	1,535	2,490 ^a	1,892	2,066
Private selling process length	1,017	384 ^a	271	504 ^a	382	384	361	404 ^a
Confidentiality agreement length	1,017	162 ^a	54	277 ^a	172	153 ^c	142	180 ^a
Short negotiation	1,017	51.4% ^a	n.a.	n.a.	50.0%	52.5%	56.5%	46.2% ^a
Deal completion probability	978	0.71 ^a	0.67	0.75	1.24	0.18 ^a	0.68	0.76
High completion probability	978	50.1% ^a	48.9%	51.4%	n.a.	n.a.	54.2%	44.6% ^a
Premium	978	34.0% ^a	37.3%	30.5% ^b	32.2%	35.8%	47.5%	16.1% ^a
Premium to conf. agreement	882	37.9% ^a	40.2%	35.4%	37.6%	37.9%	61.3%	2.8% ^a
High premium	882	60.0% ^a	64.7%	54.8% ^a	64.5%	55.3% ^a	n.a.	n.a.
Premium to initiation	967	42.9% ^a	46.0%	39.5%	43.8%	41.7%	62.9%	12.9% ^a
Premium to 1 day b.announcement	978	31.9% ^a	33.5%	30.3% ^c	31.2%	32.7%	39.2%	21.2% ^a
Offer improvement	994	1.1% ^a	1.2%	1.0%	0.2%	2.0% ^a	1.3%	0.6% ^c
$CAR_{init.,1db.conf.agr.}$	1,017	-6.1% ^a	-4.8%	-7.5%	-5.2%	-6.5%	-6.5%	-4.4%
$CAR_{conf.agr.,1db.ann.}$	1,017	-1.4%	4.2%	-7.4% ^a	-1.5%	-1.1%	8.1%	-14.8% ^a
$CAR_{-1,+1}$	871	26.3% ^a	27.0%	25.7%	29.6%	23.5% ^a	32.7%	17.8% ^a
Target initiated	1,017	0.43 ^a	0.37	0.50 ^a	0.43	0.43	0.36	0.52 ^a
Cash payment	1,017	0.70 ^a	0.64	0.77 ^a	0.82	0.60 ^a	0.75	0.63 ^a
Auction	1,017	0.33 ^a	0.21	0.46 ^a	0.35	0.31	0.27	0.39 ^a
Financial buyer	1,017	0.25 ^a	0.18	0.32 ^a	0.27	0.23	0.23	0.25

continued on next page

Variable	(1) Bidder initiated	(2) Target initiated	(3) Cash payment	(4) Stock payment	(5) Informal sale	(6) Full-scale auction	(7) Strategic buyer	(8) Financial buyer
<i>Panel B</i>								
Transaction value(million USD)	2,287	1,528 ^b	1,381	3,303 ^a	2,402	1,058 ^a	1,983	1,883
Private selling process length	309	482 ^a	394	361	346	463 ^a	366	440 ^a
Confidentiality agreement length	140	192 ^a	174	134 ^a	134	221 ^a	151	196 ^a
Short negotiation	57.2%	43.9% ^a	46.8%	62.4% ^a	60.9%	32.1% ^a	55.9%	37.9% ^a
Deal completion probability	0.68	0.75	0.71	0.70	0.69	0.75	0.67	0.82 ^c
High completion probability	50.1%	50.1%	57.9%	31.2% ^a	48.7%	53.0%	49.0%	53.5%
Premium	39.6%	26.7% ^a	35.8%	29.6% ^c	37.1%	27.8% ^a	35.8%	28.7% ^c
Premium to conf. agreement	41.9%	32.4% ^a	39.0%	35.2%	41.1%	31.1% ^a	38.7%	35.5%
High premium	66.5%	50.9% ^a	63.9%	50.8% ^a	64.0%	51.4% ^a	60.9%	57.1%
Premium to initiation	49.1%	34.7% ^a	45.9%	35.2% ^b	47.4%	33.9% ^a	43.4%	41.3%
Premium to 1 day b announcement	33.5%	29.9% ^c	33.3%	28.7% ^b	34.1%	27.5% ^a	33.2%	28.2% ^b
Offer improvement	1.5%	0.5% ^a	1.2%	0.9%	1.3%	0.7% ^c	1.0%	1.5%
$CAR_{init.,1db.conf.agr.}$	-2.4%	-11.0% ^a	-5.0%	-8.6%	-6.3%	-5.6%	-5.4%	-8.1%
$CAR_{conf.agr.,1db.ann.}$	2.1%	-6.1% ^a	-2.1%	0.1%	1.6%	-7.6% ^a	-1.2%	-2.0%
$CAR_{-1,+1}$	27.9%	24.4% ^b	29.3%	19.4% ^a	28.4%	22.3% ^a	27.2%	23.8% ^c
Target initiated	n.a.	n.a.	0.42	0.46	0.32	0.66 ^a	0.42	0.48
Cash payment	0.71	0.69	n.a.	n.a.	0.63	0.85 ^a	0.61	0.98 ^a
Auction	0.20	0.50 ^a	0.40	0.17 ^a	n.a.	n.a.	0.26	0.53 ^a
Financial buyer	0.23	0.27	0.35	0.01 ^a	0.17	0.40 ^a	n.a.	n.a.

Table 2: Summary statistics for insider trading in target firms before the public announcement

The table shows mean net purchases across target firms during the pre-announcement (column 1) and control period (column 2) and matched firms during the pre-announcement (column 3) and control period (column 4). Panels A and B report means for insider trading after signing confidentiality agreements (up to the public announcement) and before signing confidentiality agreements (in the early pre-announcement period starting at the initiation date), respectively. Insiders are top executives and directors. We measure net purchases as a percentage of shares outstanding in basis points and scale them on a monthly basis and winsorize them at the 5th and 95th percentiles. The data covers 1017 target and 1017 matched firms. All variables are defined in Appendix A. We test for differences in means using the *t*-test allowing for unequal variances. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent levels.

	Target firms		Matched firms		Mean difference			
	Pre-ann. (1)	Control (2)	Pre-ann. (3)	Control (4)	(1) vs (2)	(1) vs (3)	(3) vs (4)	(1)-(2) vs (3)-(4)
<i>Panel A: After signing confidentiality agreement</i>								
All deals	-1.067 ^a	-2.179	-1.883	-2.365	1.112 ^a	0.816 ^a	0.482 ^b	0.630 ^b
Short negotiation	-0.821 ^a	-2.082	-1.326	-1.694	1.261 ^a	0.505 ^b	0.368	0.893 ^a
Long negotiation	-1.327 ^a	-2.282	-2.472	-3.075	0.955 ^a	1.145 ^a	0.603 ^c	0.352
High comp. prob.	-1.179 ^a	-2.229	-2.053	-2.363	1.050 ^a	0.874 ^a	0.310	0.740 ^b
Low comp. prob.	-0.967 ^a	-2.195	-1.713	-2.378	1.227 ^a	0.745 ^a	0.665 ^b	0.562
High premium	-1.183 ^a	-2.429	-1.881	-2.453	1.246 ^a	0.698 ^a	0.572 ^c	0.674 ^c
Low premium	-0.815 ^a	-1.936	-1.627	-2.344	1.121 ^a	0.812 ^a	0.717 ^b	0.404
Bidder initiated	-1.027 ^a	-2.242	-1.785	-2.212	1.214 ^a	0.758 ^a	0.427	0.787 ^b
Target initiated	-1.119 ^a	-2.098	-2.010	-2.563	0.979 ^a	0.891 ^a	0.553 ^c	0.426
Cash	-1.178 ^a	-2.467	-2.107	-2.491	1.289 ^a	0.929 ^a	0.384	0.906 ^a
Stock	-0.805 ^a	-1.500	-1.354	-2.067	0.695 ^b	0.548 ^c	0.714 ^b	-0.019
Informal sale	-1.096 ^a	-2.325	-1.723	-2.003	1.230 ^a	0.627 ^a	0.280	0.949 ^a
Auction	-1.009 ^a	-1.883	-2.207	-3.097	0.874 ^a	1.198 ^a	0.890 ^b	-0.016
Strategic buyer	-1.069 ^a	-2.280	-1.745	-2.274	1.210 ^a	0.676 ^a	0.529 ^b	0.681 ^b
Financial buyer	-1.060 ^a	-1.876	-2.298	-2.639	0.816 ^b	1.239 ^a	0.340	0.476
<i>Panel B: Before signing confidentiality agreement</i>								
All deals	-1.674 ^a	-2.028	-2.046	-2.161	0.354 ^c	0.372 ^c	0.115	0.239
Short negotiation	-1.933 ^a	-2.329	-1.825	-2.375	0.396	-0.108	0.550 ^c	-0.154
Long negotiation	-1.399 ^a	-1.708	-2.279	-1.934	0.310	0.881 ^a	-0.345	0.655 ^c
High comp. prob.	-1.719 ^a	-2.249	-2.295	-2.152	0.530 ^c	0.576 ^c	-0.143	0.674 ^c
Low comp. prob.	-1.584 ^a	-1.865	-1.912	-2.017	0.281	0.328	0.105	0.176
High premium	-1.674 ^a	-2.006	-2.152	-2.084	0.331	0.478 ^c	-0.068	0.400
Low premium	-1.638 ^a	-2.032	-1.954	-2.377	0.393	0.315	0.423	-0.030
Bidder initiated	-1.460 ^a	-1.941	-1.833	-1.896	0.481 ^c	0.373	0.063	0.419
Target initiated	-1.951 ^a	-2.139	-2.322	-2.505	0.188	0.371	0.183	0.006
Cash	-1.793 ^a	-2.307	-2.280	-2.241	0.513 ^b	0.486 ^c	-0.038	0.552 ^c
Stock	-1.391 ^a	-1.369	-1.495	-1.971	-0.022	0.104	0.476	-0.498
Informal sale	-1.723 ^a	-2.094	-1.876	-1.896	0.371	0.154	0.020	0.351
Auction	-1.573 ^a	-1.894	-2.389	-2.697	0.320 ^b	0.816	0.308	0.013
Strategic buyer	-1.761 ^a	-2.031	-1.959	-2.174	0.270	0.198	0.215	0.055
Financial buyer	-1.409 ^a	-2.017	-2.307	-2.121	0.608 ^b	0.898	-0.186	0.794

Table 3: Testing difference in differences assumptions

This table reports means for insider purchases, sales and net purchases by top executives and directors, measured as a percentage of common equity in basis points per month, for 1017 target and 1017 matched firms over the control period. The control period lies before the initiation date and matches the pre-announcement event period in length and calendar months. The table reports means across the whole control period, but also for the earlier versus later control period and the corresponding change where the cutoff date corresponds to the confidentiality agreement date in the event period. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent levels.

	(1)	(2)	(3)	(4)
	Whole control period	Earlier control period	Later control period	Change
<i>Panel A: Purchases</i>				
Target firms	0.585	0.271	0.354	0.083 ^a
Matched firms	0.499	0.271	0.287	0.016
Target vs. matched	0.087	0.000	0.068	0.068
<i>Panel B: Sales</i>				
Target firms	3.488	2.318	2.618	0.300
Matched firms	3.570	2.506	2.708	0.201
Target vs. matched	-0.083	-0.188	-0.089	0.098
<i>Panel C: Net purchases</i>				
Target firms	-2.881	-2.028	-2.179	-0.152
Matched firms	-3.032	-2.161	-2.365	-0.204
Target vs. matched	0.150	0.133	0.185	0.052

Table 4: Insider trading in target firms before public announcements: pooled results

This table reports OLS estimation results for insider purchases, sales and net purchases in target and matched firms before the takeover public announcement date. Insider trading is by top executives and directors and is measured as a percentage of equity in basis points per month and is winsorized at the 5th and 95th percentiles. Panels A, B and C report results for insider trading after signing confidentiality agreements (up to the public announcement), before signing confidentiality agreements (in the early pre-announcement period starting at the initiation date) and during the whole pre-announcement period, respectively. The data covers 1017 target and 1017 matched firms over the pre-announcement and the control periods. We report Hubert/White robust standard errors in brackets. All variables are defined in Appendix A. All regressions include a set of control variables (natural log of market capitalization, book to market ratio, volatility of daily stock returns, change in volatility of daily stock returns, insider ownership, R&D over total sales, liquidity, pre-announcement period length, time and industry dummies), which are not reported. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent levels.

	(1)	(2)	(3)
	Purchases	Sales	Net purchases
<i>Panel A: After signing confidentiality agreement</i>			
Target x pre-announcement	-0.226 ^a (0.045)	-0.883 ^a (0.309)	0.627 ^b (0.304)
Pre-announcement	-0.051 (0.034)	-0.441 ^c (0.242)	0.363 (0.238)
Target	0.052 (0.036)	-0.267 (0.247)	0.349 (0.242)
Constant	0.398 ^a (0.123)	2.236 ^a (0.779)	-1.682 ^b (0.761)
# observations	3,510	3,510	3,510
F	9.259 ^a	9.288 ^a	8.755 ^a
R ²	9.60%	8.50%	7.70%
<i>Panel B: Before signing confidentiality agreement</i>			
Target x pre-announcement	-0.095 ^b (0.042)	-0.366 (0.312)	0.282 (0.309)
Pre-announcement	-0.020 (0.032)	0.004 (0.242)	-0.042 (0.239)
Target	0.004 (0.032)	-0.241 (0.234)	0.214 (0.231)
Constant	0.068 (0.114)	0.536 (0.764)	-0.301 (0.761)
# observations	3,510	3,510	3,510
F	10.66 ^a	13.44 ^a	13.70 ^a
R ²	10.00%	11.60%	11.30%
<i>Panel C: Whole pre-announcement period</i>			
Target x pre-announcement	-0.325 ^a (0.069)	-0.962 ^a (0.360)	0.640 ^c (0.360)
Pre-announcement	-0.023 (0.054)	-0.159 (0.279)	0.115 (0.278)
Target	0.060 (0.054)	-0.235 (0.277)	0.281 (0.277)
Constant	0.445 ^b (0.198)	2.037 ^b (0.937)	-1.431 (0.944)
# observations	3,510	3,510	3,510
F	12.81 ^a	15.89 ^a	15.51 ^a
R ²	11.90%	14.50%	13.50%

Table 5: Insider trading in target firms before public announcements: cross-sectional uncertainty

This table reports OLS estimation results for insider net purchases in target and matched firms before the public announcement date for short versus long negotiations (columns 1 and 2) and high versus low completion probability (columns 3 and 4). Panel A covers insider trading after signing confidentiality agreements (up to the public announcement), while Panel B covers insider trading before signing confidentiality agreements (in the early pre-announcement period starting at the initiation date). The dependent variable in all specifications is the net insider purchases by top executives and directors measured as a fraction of market capitalization in basis points per month over the given pre-announcement or control period for 1017 target and 1017 matched firms. It is winsorized at the 5th and 95th percentiles. We report Hubert/White robust standard errors in brackets. All variables are defined in Appendix A. All regressions include a set of control variables (dummy variables for target firms and control period, natural log of market capitalization, book to market ratio, volatility of daily stock returns, change in volatility of daily stock returns, insider ownership, R&D over total sales, liquidity, pre-announcement period length, time and industry dummies), which are not reported. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent levels.

	(1)	(2)	(3)	(4)
	Negotiation length		Completion probability	
	short	long	high	low
<i>Panel A: After signing confidentiality agreement</i>				
Target x pre-announcement	0.952 ^b (0.384)	0.260 (0.469)	0.855 ^c (0.441)	0.426 (0.433)
# observations	1,823	1,687	1,708	1,683
F	4.304 ^a	6.101 ^a	4.912 ^a	4.989 ^a
R ²	6.40%	11.70%	8.30%	9.40%
<i>Panel B: Before signing confidentiality agreement</i>				
Target x pre-announcement	0.168 (0.484)	0.305 (0.402)	0.861 ^c (0.460)	0.010 (0.424)
# observations	1,415	2,095	1,708	1,683
F	5.494 ^a	9.152 ^a	7.140 ^a	7.354 ^a
R ²	11.80%	12.10%	11.10%	13.10%

Table 6: Insider trading in target firms before public announcements: realized premium

This table reports OLS estimation results for insider net purchases in target and matched firms after public announcements across partitions by realized takeover premium. Panel A covers insider trading after signing confidentiality agreements (up to the public announcement), while Panel B covers insider trading before signing confidentiality agreements (from the deal initiation). The dependent variable in all specifications is the net insider purchases by top executives and directors measured as a fraction of market capitalization in basis points per month over the given pre-announcement or control period for 1017 target and 1017 matched firms. It is winsorized at the 5th and 95th percentiles. We report Hubert/White robust standard errors in brackets. All variables are defined in Appendix A. All regressions include a set of control variables (dummy variables for target firms and control period, natural log of market capitalization, book to market ratio, volatility of daily stock returns, change in volatility of daily stock returns, insider ownership, R&D over total sales, liquidity, pre-announcement period length, time and industry dummies), which are not reported. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Premium high	Premium median low	Premium quintile 5	Premium quintiles 3&4	Premium quintiles 1&2	Premium quintiles 3-5	Premium quintiles 1&2
Target x pre-announcement	0.549 (0.479)	0.534 (0.440)	0.499 (0.773)	1.021 ^c (0.527)	0.212 (0.475)	0.754 ^c (0.436)	0.212 (0.475)
# observations	1,519	1,542	588	1,259	1,214	1,847	1,214
F	4.388 ^a	4.823 ^a	3.331 ^a	3.668 ^a	4.218 ^a	5.594 ^a	4.218 ^a
R ²	8.40%	10.00%	15.60%	7.80%	11.90%	8.40%	11.90%
<i>Panel A: After signing confidentiality agreement</i>							
Target x pre-announcement	0.719 (0.461)	-0.228 (0.471)	0.905 (0.763)	0.605 (0.526)	-0.374 (0.502)	0.667 (0.433)	-0.374 (0.502)
# observations	1,519	1,542	588	1,259	1,214	1,847	1,214
F	6.588 ^a	6.697 ^a	3.114 ^a	6.594 ^a	5.550 ^a	8.104 ^a	5.550 ^a
R ²	12.20%	12.80%	13.70%	13.40%	15.40%	12.10%	15.40%
<i>Panel B: Before signing confidentiality agreement</i>							

Table 7: Insider trading in target firms before public announcements: deal characteristics

This table reports OLS estimation results for insider net purchases in target and matched firms before the public announcement date for bidder versus target deal initiation (columns 1 and 2), cash versus stock payment (columns 3 and 4), informal sale versus formal auction (columns 5 and 6) and strategic versus financial buyer (columns 7 and 8). Panel A covers insider trading after signing confidentiality agreements (up to the public announcement), while Panel B covers insider trading before signing confidentiality agreements (in the early pre-announcement period starting at the initiation date). The dependent variable in all specifications is the net insider purchases (purchases minus sales) by top executives and directors measured as a fraction of market capitalization in basis points per month over the given pre-announcement or control period for 1017 target and 1017 matched firms. It is winsorized at the 5th and 95th percentiles. We report Hubert/White robust standard errors in brackets. All variables are defined in Appendix A. All regressions include a set of control variables (dummy variables for target firms and control period, natural log of market capitalization, book to market ratio, volatility of daily stock returns, change in volatility of daily stock returns, insider ownership, R&D over total sales, liquidity, pre-announcement period length, time and industry dummies), which are not reported. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Initiation		Payment		Selling method		Buyer type	
	bidder	target	cash	stock	inf.sale	auction	strategic	financial
<i>Panel A: After signing confidentiality agreement</i>								
Target x pre-announcement	0.777 ^c (0.402)	0.462 (0.460)	0.882 ^b (0.375)	0.080 (0.505)	0.947 ^a (0.365)	-0.002 (0.535)	0.604 ^c (0.347)	0.658 (0.620)
# observations	1,989	1,521	2,479	1,031	2,344	1,166	2,637	873
F	5.765 ^a	4.601 ^a	6.666 ^a	2.808 ^a	5.117 ^a	5.483 ^a	7.535 ^a	2.444 ^a
R ²	7.80%	9.90%	7.80%	10.20%	7.00%	12.80%	9.20%	6.80%
<i>Panel B: Before signing confidentiality agreement</i>								
Target x pre-announcement	0.457 (0.398)	0.178 (0.486)	0.696 ^c (0.380)	-0.706 (0.521)	0.359 (0.369)	0.194 (0.559)	0.085 (0.357)	0.952 (0.616)
# observations	1,989	1,521	2,479	1,031	2,344	1,166	2,637	873
F	6.994 ^a	7.931 ^a	10.81 ^a	3.633 ^a	8.827 ^a	5.860 ^a	11.38 ^a	3.716 ^a
R ²	9.70%	15.20%	12.00%	11.10%	10.70%	14.80%	12.40%	12.10%

Table 8: Complementarity between takeover premium and deal characteristics

This table reports OLS estimation results for insider net purchases in target and matched firms before public announcements across different partitions for takeover premium and deal characteristics. Panel A covers insider trading after signing confidentiality agreements (up to the public announcement), while Panel B covers insider trading before signing confidentiality agreements (in the early pre-announcement period starting at the initiation date). The dependent variable in all specifications is the net insider purchases by top executives and directors measured as a fraction of market capitalization in basis points per month over the given pre-announcement or control period for 1017 target and 1017 matched firms. It is winsorized at the 5th and 95th percentiles. We report Hubert/White robust standard errors in brackets. All variables are defined in Appendix A. All specifications include a set of control variables (dummy variables for target firms and control period, natural log of market capitalization, book to market ratio, volatility of daily stock returns, change in volatility of daily stock returns, insider ownership, R&D over total sales, liquidity, pre-announcement period length, time and industry dummies), but their coefficients are not reported. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Premium q5		Premium q3&4		Premium q1&2		Premium q5		Premium q3&4		Premium q1&2	
	bidder	target	bidder	target	bidder	target	cash	stock	cash	stock	cash	stock
Target x pre-ann.	0.055 (0.914)	1.449 (1.300)	1.339 ^b (0.673)	0.496 (0.854)	0.172 (0.667)	0.242 (0.682)	0.109 (0.923)	1.816 (1.439)	1.421 ^b (0.598)	-0.264 (1.098)	0.524 (0.632)	-0.347 (0.680)
# observations	393	195	798	461	579	635	435	153	974	285	763	451
F	2.667 ^a	2.322 ^a	3.472 ^a	2.196 ^a	2.154 ^a	3.258 ^a	2.748 ^a	2.393 ^a	3.243 ^a	1.542 ^b	3.580 ^a	1.894 ^a
R ²	18.40%	27.20%	8.90%	12.50%	13.30%	14.80%	15.60%	38.60%	8.70%	16.40%	14.60%	13.00%
	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	strat.	fina.	strat.	fina.	strat.	fina.
Target x pre-ann.	0.316 (0.892)	1.230 (1.580)	1.353 ^b (0.619)	0.309 (0.984)	0.619 (0.586)	-0.519 (0.764)	0.514 (0.867)	0.008 (1.525)	0.717 (0.614)	1.696 (1.039)	0.418 (0.540)	-0.414 (0.956)
# observations	445	143	893	366	741	473	477	111	940	319	913	301
F	2.413 ^a	1.984 ^a	2.718 ^a	2.277 ^a	2.222 ^a	3.329 ^a	2.941 ^a	2.125 ^a	3.664 ^a	1.834 ^a	3.217 ^a	3.047 ^a
R ²	14.60%	29.00%	7.90%	16.20%	12.60%	18.40%	17.30%	38.60%	9.40%	8.20%	12.70%	21.10%
	bidder	target	bidder	target	bidder	target	cash <td>stock</td> <td>cash <td>stock</td> <td>cash <td>stock</td> </td></td>	stock	cash <td>stock</td> <td>cash <td>stock</td> </td>	stock	cash <td>stock</td>	stock
Target x pre-ann.	1.323 (0.872)	-0.157 (1.498)	0.877 (0.644)	0.194 (0.921)	-0.155 (0.694)	-0.421 (0.728)	1.459 (0.902)	-0.907 (1.374)	0.965 (0.600)	-0.698 (1.072)	-0.577 (0.672)	-0.048 (0.723)
# observations	393	195	798	461	579	635	435	153	974	285	763	451
F	2.204 ^a	2.146 ^a	3.762 ^a	3.480 ^a	2.071 ^a	4.493 ^a	2.631 ^a	2.514 ^a	5.366 ^a	1.765 ^b	4.318 ^a	2.290 ^a
R ²	15.20%	20.70%	13.40%	17.60%	12.30%	20.40%	15.50%	33.90%	13.70%	20.70%	17.30%	18.70%

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Premium q5		Premium q3&4		Premium q1&2		Premium q5		Premium q3&4		Premium q1&2	
	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	strat.	fin.	strat.	fin.	strat.	fin.
Target x pre-ann.	0.560 (0.851)	1.949 (-1.681)	0.646 (0.614)	0.531 (1.031)	-0.136 (0.620)	-0.645 (0.828)	0.821 (0.855)	1.197 (-1.846)	0.396 (0.627)	0.949 (0.917)	-0.361 (0.575)	-0.451 (0.983)
# observations	445	143	893	366	741	473	477	111	940	319	913	301
F	2.252 ^a	1.630 ^b	4.954 ^a	2.491 ^a	3.396 ^a	3.611 ^a	2.553 ^a	1.090	6.134 ^a	2.312 ^a	4.438 ^a	3.357 ^a
R ²	14.30%	30.00%	14.50%	16.30%	14.00%	24.00%	15.00%	19.60%	15.80%	20.70%	15.60%	28.90%

Table 9: Cross-sectional uncertainty versus takeover premium and deal characteristics

This table reports OLS estimation results for insider net purchases in target and matched firms before the public announcement date across different partitions for uncertainty, realized takeover premium and deal characteristics. Panel A covers insider trading after signing confidentiality agreements (up to the public announcement), while Panel B covers insider trading before signing confidentiality agreements (in the early pre-announcement period starting at the initiation date). The dependent variable in all specifications is the net insider purchases (purchases minus sales) by top executives and directors measured as a fraction of market capitalization in basis points per month over the given pre-announcement or control period for 1017 target and 1017 matched firms. It is winsorized at the 5th and 95th percentiles. We report Hubert/White robust standard errors in brackets. All variables are defined in Appendix A. All regressions include a set of control variables (dummy variables for target firms and control period, natural log of market capitalization, book to market ratio, volatility of daily stock returns, change in volatility of daily stock returns, insider ownership, R&D over total sales, liquidity, pre-announcement period length, time and industry dummies), which are not reported. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Short negotiation		Long negotiation		High probability		Low probability	
<i>Panel A: After signing confidentiality agreement</i>								
	Prem. q5	Prem. q3&4	Prem. q5	Prem. q3&4	Prem. q5	Prem. q3&4	Prem. q5	Prem. q3&4
Target x pre-announcement	0.767 (0.927)	1.315 ^b (0.641)	0.413 (1.189)	0.676 (0.902)	0.802 (1.085)	1.289 ^c (0.698)	0.208 (1.100)	0.890 (0.809)
# observations	298	746	290	513	318	694	259	563
F	1.808 ^a	2.613 ^a	3.381 ^a	2.506 ^a	2.164 ^a	2.828 ^a	2.471 ^a	2.310 ^a
R ²	18.50%	8.50%	28.50%	13.70%	18.90%	9.70%	26.40%	10.20%
	Prem. q1&2		Prem. q1&2		Prem. q1&2		Prem. q1&2	
Target x pre-announcement	0.392 (0.604)		0.051 (0.700)		0.532 (0.715)		-0.128 (0.626)	
# observations	578		636		532		674	
F	1.498 ^b		3.835 ^a		2.481 ^a		3.039 ^a	
R ²	11.00%		17.90%		15.90%		15.70%	
	bidder	target	bidder	target	bidder	target	bidder	target
Target x pre-announcement	1.088 ^b (0.507)	0.728 (0.587)	0.337 (0.657)	0.268 (0.667)	1.249 ^b (0.577)	0.296 (0.673)	0.388 (0.574)	0.471 (0.649)
# observations	1,154	669	835	852	978	730	952	731
F	2.976 ^a	2.194 ^a	4.123 ^a	3.561 ^a	4.184 ^a	2.947 ^a	2.473 ^a	4.219 ^a
R ²	7.00%	8.90%	13.10%	13.40%	10.90%	10.00%	7.10%	17.20%
	cash	stock	cash	stock	cash	stock	cash	stock
Target x pre-announcement	1.186 ^b (0.497)	0.541 (0.601)	0.619 (0.547)	-0.926 (0.887)	1.117 ^b (0.502)	-0.282 (0.911)	0.653 (0.578)	0.051 (0.637)
# observations	1,174	649	1,305	382	1,399	309	1,024	659
F	3.612 ^a	1.647 ^b	5.070 ^a	2.174 ^a	4.273 ^a	1.545 ^b	3.821 ^a	2.527 ^a
R ²	7.60%	7.70%	11.60%	21.70%	8.40%	12.10%	10.10%	13.60%
	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.
Target x pre-announcement	1.305 ^a (0.438)	-0.556 (0.782)	0.346 (0.638)	0.179 (0.685)	1.075 ^b (0.538)	0.516 (0.760)	0.939 ^c (0.509)	-0.861 (0.803)
# observations	1,445	378	899	788	1,121	587	1,145	538
F	3.678 ^a	1.890 ^a	3.071 ^a	4.989 ^a	3.462 ^a	3.508 ^a	2.478 ^a	4.142 ^a
R ²	7.30%	12.60%	10.50%	16.40%	9.60%	12.10%	6.50%	20.20%
	strat.	fin.	strat.	fin.	strat.	fin.	strat.	fin.
Target x pre-announcement	0.990 ^b (0.435)	0.908 (0.826)	0.073 (0.562)	0.538 (0.862)	0.713 (0.502)	1.056 (0.908)	0.532 (0.498)	0.165 (0.881)
# observations	1,482	341	1,083	532	1,258	450	1,278	405
F	4.330 ^a	1.606 ^b	5.855 ^a	2.780 ^a	4.897 ^a	1.924 ^a	3.920 ^a	2.169 ^a
R ²	7.30%	8.70%	17.20%	10.70%	11.00%	8.60%	10.10%	12.90%

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Short negotiation		Long negotiation		High probability		Low probability	
<i>Panel B: Before signing confidentiality agreement</i>								
	Prem. q5	Prem. q3&4	Prem. q5	Prem. q3&4	Prem. q5	Prem. q3&4	Prem. q5	Prem. q3&4
Target x pre-announcement	1.191 (0.929)	0.407 (0.691)	0.713 (1.324)	0.800 (0.787)	1.469 (1.083)	0.955 (0.753)	1.117 (1.025)	0.279 (0.718)
# observations	343	627	245	632	318	694	259	563
F	1.935 ^a	2.361 ^a	2.534 ^a	5.276 ^a	1.949 ^a	3.942 ^a	2.199 ^a	3.524 ^a
R ²	13.50%	8.40%	21.70%	20.30%	16.20%	13.50%	21.40%	17.90%
	Prem. q1&2		Prem. q1&2		Prem. q1&2		Prem. q1&2	
Target x pre-announcement	1.036 (0.675)		-1.624 ^b (0.730)		0.363 (0.771)		-0.926 (0.668)	
# observations	606		608		532		674	
F	2.135 ^a		5.042 ^a		2.521 ^a		4.388 ^a	
R ²	11.50%		23.40%		14.80%		19.10%	
	bidder	target	bidder	target	bidder	target	bidder	target
Target x pre-announcement	0.671 (0.466)	0.567 (0.713)	0.078 (0.686)	-0.191 (0.644)	1.420 ^b (0.605)	0.127 (0.711)	-0.104 (0.517)	0.157 (0.686)
# observations	1,192	617	797	904	978	730	952	731
F	3.048 ^a	2.725 ^a	5.330 ^a	7.240 ^a	4.799 ^a	3.734 ^a	3.823 ^a	5.880 ^a
R ²	5.80%	13.80%	16.60%	20.50%	13.20%	12.20%	10.60%	22.60%
	cash	stock	cash	stock	cash	stock	cash	stock
Target x pre-announcement	0.988 ^b (0.479)	-0.044 (0.682)	0.366 (0.583)	-1.183 (0.773)	1.056 ^b (0.517)	-0.059 (0.990)	0.483 (0.571)	-0.754 (0.631)
# observations	1,279	530	1,200	501	1,399	309	1,024	659
F	4.400 ^a	2.087 ^a	8.713 ^a	3.424 ^a	6.110 ^a	1.561 ^b	5.634 ^a	2.493 ^a
R ²	7.90%	8.40%	17.40%	18.60%	11.60%	15.60%	14.50%	12.60%
	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.
Target x pre-announcement	0.760 ^c (0.459)	0.470 (0.760)	-0.166 (0.580)	-0.030 (0.806)	1.148 ^b (0.567)	0.261 (0.800)	-0.016 (0.487)	-0.085 (0.814)
# observations	1,281	528	1,063	638	1,121	587	1,145	538
F	3.154 ^a	2.522 ^a	7.516 ^a	4.841 ^a	5.547 ^a	2.877 ^a	4.568 ^a	4.550 ^a
R ²	5.20%	15.10%	17.70%	19.20%	12.40%	12.40%	11.40%	21.70%
	strat.	fina.	strat.	fina.	strat.	fina.	strat.	fina.
Target x pre-announcement	0.463 (0.459)	1.100 (0.776)	-0.336 (0.541)	0.582 (0.926)	0.854 (0.546)	0.843 (0.859)	-0.317 (0.477)	1.001 (0.928)
# observations	1,383	426	1,254	447	1,258	450	1,278	405
F	3.764 ^a	1.507 ^b	8.869 ^a	3.596 ^a	6.205 ^a	1.981 ^a	5.436 ^a	6.216 ^a
R ²	6.30%	10.10%	19.00%	18.10%	12.80%	11.70%	13.60%	17.00%

Internet appendix to

“Savvy target insiders’ trading before the public takeover announcements”

(not for publication)

This appendix presents supplementary results not included in the main body of the paper.

Table I.1: Summary statistics for insider purchases and sales in target firms before the public announcement

The table shows mean insider purchases and sales across 1017 target firms during the pre-announcement (column 1) and control period (column 2) and 1017 matched firms during the pre-announcement (column 3) and control period (column 4). Panels A, B and C report means for insider trading after signing confidentiality agreements (up to the public announcement), before signing confidentiality agreements (in the early pre-announcement period starting at the initiation date) and during the whole pre-announcement period, respectively. Insiders are top executives and directors. We measure purchases and sales as a percentage of shares outstanding in basis points and scale them on a monthly basis. We winsorize the insider trading variables at the 5th and 95th percentiles. All variables are defined in Appendix A. We test for differences in means using the *t*-test allowing for unequal variances. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent levels.

	Target firms		Matched firms		Mean difference			
	Pre-ann. (1)	Control (2)	Pre-ann. (3)	Control (4)	(1) vs (2)	(1) vs (3)	(3) vs (4)	(1)–(2) vs (3)–(4)
<i>Panel A: After signing confidentiality agreement</i>								
<i>Purchases</i>								
All deals	0.091 ^a	0.354	0.262	0.287	-0.263 ^a	-0.171 ^a	-0.025	-0.238 ^a
Short negotiation	0.028 ^a	0.207	0.144	0.206	-0.179 ^a	-0.116 ^a	-0.062	-0.117 ^a
Long negotiation	0.158 ^a	0.511	0.386	0.372	-0.353 ^a	-0.228 ^a	0.014	-0.367 ^a
High comp. prob.	0.112 ^a	0.364	0.270	0.327	-0.253 ^a	-0.159 ^a	-0.057	-0.196 ^a
Low comp. prob.	0.059 ^a	0.347	0.242	0.237	-0.288 ^a	-0.183 ^a	0.004	-0.293 ^a
High premium	0.068 ^a	0.297	0.248	0.271	-0.229 ^a	-0.179 ^a	-0.024	-0.205 ^a
Low premium	0.106 ^a	0.398	0.272	0.278	-0.292 ^a	-0.166 ^a	-0.007	-0.285 ^a
Bidder initiated	0.090 ^a	0.311	0.236	0.235	-0.221 ^a	-0.147 ^a	0.002	-0.223 ^a
Target initiated	0.093 ^a	0.411	0.295	0.355	-0.318 ^a	-0.202 ^a	-0.060	-0.258 ^a
Cash	0.110 ^a	0.349	0.254	0.272	-0.239 ^a	-0.144 ^a	-0.018	-0.222 ^a
Stock	0.047 ^a	0.367	0.279	0.321	-0.320 ^a	-0.233 ^a	-0.042	-0.278 ^a
Informal sale	0.073 ^a	0.283	0.235	0.274	-0.210 ^a	-0.162 ^a	-0.039	-0.171 ^a
Auction	0.128 ^a	0.500	0.317	0.313	-0.372 ^a	-0.188 ^a	0.003	-0.375 ^a
Strategic buyer	0.085 ^a	0.372	0.272	0.285	-0.288 ^a	-0.188 ^a	-0.012	-0.275 ^a
Financial buyer	0.111 ^a	0.301	0.231	0.293	-0.190 ^a	-0.119 ^b	-0.063	-0.127 ^c
<i>Sales</i>								
All deals	1.176 ^a	2.618	2.163	2.708	-1.443 ^a	-0.988 ^a	-0.544 ^b	-0.898 ^a
Short negotiation	0.867 ^a	2.369	1.502	1.946	-1.502 ^a	-0.635 ^a	-0.444 ^c	-1.058 ^a
Long negotiation	1.503 ^a	2.882	2.864	3.514	-1.380 ^a	-1.361 ^a	-0.651 ^c	-0.729 ^c
High comp. prob.	1.298 ^a	2.647	2.353	2.706	-1.349 ^a	-1.055 ^a	-0.353	-0.996 ^a
Low comp. prob.	1.045 ^a	2.660	1.966	2.683	-1.615 ^a	-0.921 ^a	-0.717 ^b	-0.898 ^b
High premium	1.265 ^a	2.820	2.147	2.756	-1.555 ^a	-0.882 ^a	-0.609 ^b	-0.946 ^a
Low premium	0.941 ^a	2.387	1.920	2.730	-1.446 ^a	-0.980 ^a	-0.809 ^b	-0.637
Bidder initiated	1.125 ^a	2.613	2.035	2.486	-1.488 ^a	-0.909 ^a	-0.451	-1.036 ^a

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	Target firms		Matched firms		Mean difference			
	Pre-ann. (1)	Control (2)	Pre-ann. (3)	Control (4)	(1) vs (2)	(1) vs (3)	(3) vs (4)	(1)-(2) vs (3)-(4)
Target initiated	1.241 ^a	2.625	2.331	2.996	-1.384 ^a	-1.090 ^a	-0.665 ^b	-0.719 ^c
Cash	1.299 ^a	2.922	2.379	2.825	-1.623 ^a	-1.080 ^a	-0.446 ^c	-1.177 ^a
Stock	0.884 ^a	1.902	1.655	2.431	-1.018 ^a	-0.770 ^a	-0.777 ^b	-0.241
Informal sale	1.194 ^a	2.665	1.980	2.313	-1.471 ^a	-0.787 ^a	-0.332	-1.139 ^a
Auction	1.139 ^a	2.524	2.534	3.509	-1.385 ^a	-1.395 ^a	-0.974 ^b	-0.410
Strategic buyer	1.176 ^a	2.737	2.039	2.612	-1.562 ^a	-0.863 ^a	-0.573 ^b	-0.989 ^a
Financial buyer	1.176 ^a	2.258	2.538	2.997	-1.083 ^a	-1.363 ^a	-0.458	-0.624

Panel B: Before signing confidentiality agreement

<i>Purchases</i>								
All deals	0.171 ^a	0.271	0.263	0.271	-0.100 ^a	-0.091 ^a	-0.008	-0.091 ^a
Short negotiation	0.143 ^a	0.287	0.288	0.245	-0.143 ^a	-0.145 ^a	0.043	-0.186 ^a
Long negotiation	0.201 ^a	0.255	0.236	0.298	-0.054	-0.035	-0.063	0.009
High comp. prob.	0.174 ^a	0.272	0.247	0.293	-0.099 ^b	-0.073 ^c	-0.046	-0.052
Low comp. prob.	0.176 ^a	0.270	0.265	0.256	-0.094 ^b	-0.089 ^b	0.009	-0.103 ^b
High premium	0.184 ^a	0.248	0.257	0.276	-0.063 ^c	-0.073 ^c	-0.019	-0.044
Low premium	0.156 ^a	0.283	0.238	0.259	-0.127 ^c	-0.081 ^c	-0.021	-0.106 ^c
Bidder initiated	0.141 ^a	0.208	0.216	0.230	-0.067 ^b	-0.075 ^b	-0.014	-0.053
Target initiated	0.211 ^a	0.354	0.323	0.324	-0.143 ^b	-0.112 ^b	-0.001	-0.142 ^b
Cash	0.161 ^a	0.259	0.243	0.308	-0.099 ^a	-0.082 ^a	-0.065 ^c	-0.034
Stock	0.196 ^a	0.299	0.309	0.185	-0.103 ^c	-0.113 ^b	0.125 ^b	-0.228 ^a
Informal sale	0.158 ^a	0.246	0.243	0.257	-0.087 ^a	-0.084 ^a	-0.014	-0.073 ^c
Auction	0.197 ^a	0.322	0.302	0.300	-0.125 ^b	-0.105 ^b	0.003	-0.128 ^c
Strategic buyer	0.177 ^a	0.278	0.260	0.267	-0.102 ^a	-0.083 ^a	-0.007	-0.095 ^b
Financial buyer	0.155 ^a	0.250	0.270	0.283	-0.095 ^c	-0.115 ^b	-0.013	-0.082

<i>Sales</i>								
All deals	1.857 ^a	2.318	2.346	2.506	-0.461 ^b	-0.488 ^b	-0.161	-0.300
Short negotiation	2.095 ^a	2.630	2.137	2.649	-0.535 ^c	-0.042	-0.512 ^c	-0.024
Long negotiation	1.606 ^a	1.988	2.567	2.356	-0.382	-0.961 ^a	0.211	-0.594
High comp. prob.	1.900 ^a	2.552	2.580	2.495	-0.652 ^b	-0.680 ^b	0.085	-0.736 ^c
Low comp. prob.	1.776 ^a	2.145	2.219	2.370	-0.368	-0.443	-0.151	-0.217
High premium	1.861 ^a	2.271	2.421	2.463	-0.410 ^c	-0.560	-0.042	-0.368 ^a
Low premium	1.806 ^a	2.336	2.229	2.676	-0.529	-0.423	-0.447	-0.083
Bidder initiated	1.616 ^a	2.175	2.090	2.159	-0.558 ^b	-0.474 ^c	-0.069	-0.490
Target initiated	2.171 ^a	2.505	2.678	2.958	-0.334	-0.507	-0.280	-0.054
Cash	1.970 ^a	2.584	2.569	2.649	-0.614 ^b	-0.599 ^b	-0.080	-0.534
Stock	1.592 ^a	1.692	1.819	2.169	-0.100	-0.226	-0.350	0.250
Informal sale	1.898 ^a	2.364	2.142	2.168	-0.466 ^c	-0.244	-0.026	-0.440
Auction	1.774 ^a	2.225	2.758	3.191	-0.451	-0.984 ^a	-0.433	-0.018
Strategic buyer	1.952 ^a	2.333	2.240	2.467	-0.382	-0.288	-0.228	-0.154
Financial buyer	1.572 ^a	2.273	2.665	2.624	-0.700 ^c	-1.093 ^a	0.042	-0.742

Panel C: Whole pre-announcement period

Purchases	0.239 ^a	0.585	0.519	0.499	-0.346 ^a	-0.280 ^a	0.020	-0.367 ^a
Sales	2.153 ^a	3.488	3.175	3.570	-1.335 ^a	-1.022 ^a	-0.395	-0.940 ^a

Table I.2: Insider trading in target firms before public announcements: dropping observations with zero days

This table reports OLS estimation results for insider purchases, sales and net purchases in target and matched firms before the takeover public announcement date as in Table 4 in the main text, but excluding deals with zero days in the given sub-period. Panel A reports results for insider trading after signing confidentiality agreements (up to the public announcement) and excludes 29 deals for which confidentiality agreements were signed on the announcement date. Panel B reports results for insider trading before signing confidentiality agreements (in the early pre-announcement period starting at the initiation date) and excludes 94 deals for which confidentiality agreements were signed on the initiation day. Insider trading is by top executives and directors and is measured as percentage of equity in basis points per month. It is winsorized at the 5th and 95th percentiles. We report Hubert/White robust standard errors in brackets. All variables are defined in Appendix A. All regressions include a set of control variables (natural log of market capitalization, book to market ratio, volatility of daily stock returns, change in volatility of daily stock returns, insider ownership, R&D over total sales, liquidity, pre-announcement period length, time and industry dummies), which are not reported. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent levels.

	(1)	(2)	(3)
	Purchases	Sales	Net purchases
<i>Panel A: After signing confidentiality agreement</i>			
Target x pre-announcement	-0.235 ^a (0.046)	-0.895 ^a (0.316)	0.629 ^b (0.311)
# observations	3,419	3,419	3,419
F	9.224 ^a	9.183 ^a	8.653 ^a
R ²	9.80%	8.60%	7.90%
<i>Panel B: Before signing confidentiality agreement</i>			
Target x pre-announcement	-0.102 ^b (0.045)	-0.386 (0.338)	0.295 (0.335)
# observations	3,192	3,192	3,192
F	10.53 ^a	12.49 ^a	13.05 ^a
R ²	10.70%	11.90%	11.80%

Table I.3: Negotiation length: before versus after confidentiality agreements

This table reports OLS estimation results for insider net purchases in target and matched firms before public announcements. We partition the sample across short versus long negotiations before signing confidentiality agreements in columns 1 and 2 and across short versus long negotiations after signing confidentiality agreements in columns 3 and 4. Columns 5 to 8 combine the two partitions together. Panel A covers insider trading after signing confidentiality agreements (up to the public announcement), while Panel B covers insider trading before signing confidentiality agreements (from the deal initiation). The dependent variable in all specifications is the net insider purchases (purchases minus sales) by top executives and directors as fraction of market capitalization in basis points per month over the given pre-announcement or control period for 1017 target and 1017 matched firms. It is winsorized at the 5th and 95th percentiles. We report Hubert/White robust standard errors in brackets. All variables are defined in Appendix A. All regressions include a set of control variables (dummy variables for target firms and control period, natural log of market capitalization, book to market ratio, volatility of daily stock returns, change in volatility of daily stock returns, insider ownership, R&D over total sales, liquidity, pre-announcement period length, time and industry dummies), which are not reported. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Before conf. agr.		After conf. agr.		Short before conf.		Long before conf.	
	short	long	short	long	short after	long after	short after	long after
<i>Panel A: After signing confidentiality agreement</i>								
Target x pre-ann.	0.902 ^b (0.432)	0.308 (0.424)	0.952 ^b (0.384)	0.260 (0.469)	1.224 ^b (0.572)	0.581 (0.643)	0.643 (0.507)	-0.071 (0.687)
# observations	1,809	1,701	1,823	1,687	910	899	913	788
F	6.402 ^a	4.288 ^a	4.304 ^a	6.101 ^a	2.831 ^a	5.109 ^a	3.441 ^a	3.321 ^a
R ²	10.80%	7.10%	6.40%	11.70%	9.20%	16.70%	7.00%	11.80%
<i>Panel B: Before signing confidentiality agreement</i>								
Target x pre-ann.	0.636 (0.395)	-0.112 (0.470)	-0.011 (0.427)	0.641 (0.446)	0.413 (0.539)	0.913 (0.579)	-0.405 (0.649)	0.294 (0.689)
# observations	1,809	1,701	1,823	1,687	910	899	913	788
F	4.389 ^a	10.83 ^a	8.980 ^a	6.175 ^a	3.279 ^a	2.817 ^a	6.966 ^a	4.859 ^a
R ²	6.20%	16.60%	13.10%	11.90%	8.20%	8.80%	17.60%	18.70%

Table I.4: Three-way complementarity: cross-sectional uncertainty, premium and deal characteristics

This table reports OLS estimation results for insider net purchases in target and matched firms after signing confidentiality agreements (up to the public announcement) and before signing confidentiality agreements (in the early pre-announcement period starting at the initiation date). The table captures the combined effect across uncertainty, premium and deal characteristics. Cross-sectional uncertainty is measured as the negotiation length in Panels A1 and B1 and deal completion probability in Panel A2 and B2. The dependent variable in all specifications is the net insider purchases (purchases minus sales) by top executives and directors measured as a fraction of market capitalization in basis points per month over the given pre-announcement or control period for 1017 target and 1017 matched firms. It is winsorized at the 5th and 95th percentiles. We report Hubert/White robust standard errors in brackets. All variables are defined in Appendix A. All regressions include a set of control variables (dummy variables for target firms and control period, natural log of market capitalization, book to market ratio, volatility of daily stock returns, change in volatility of daily stock returns, insider ownership, R&D over total sales, liquidity, pre-announcement period length, time and industry dummies), which are not reported. ^a, ^b and ^c indicate significance at the one-, five- and ten-percent levels.

	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
	Low uncertainty						High uncertainty					
	Premium q5		Premium q3&4		Premium q1&2		Premium q5		Premium q3&4		Premium q1&2	
	bidder	target	bidder	target	bidder	target	bidder	target	bidder	target	bidder	target
Target x pre-ann.	-0.512 (1.025)	1.839 (1.364)	1.652 ^b (0.799)	0.920 (1.051)	0.792 (0.840)	-0.055 (0.887)	-0.169 (1.400)	1.520 (1.876)	1.034 (1.254)	0.462 (1.352)	-0.147 (0.974)	0.643 (0.970)
# observations	260	80	535	222	301	277	183	115	274	239	301	358
F	1.918 ^b	0.670	2.156 ^a	1.158	1.246 ^c	1.579 ^b	2.880 ^a	4.429 ^a	1.897 ^a	1.893 ^a	2.797 ^a	2.819 ^a
R ²	14.50%	31.80%	7.30%	20.60%	16.50%	15.30%	31.60%	43.90%	16.60%	17.90%	22.20%	20.60%
	cash	stock	cash	stock	cash	stock	cash	stock	cash	stock	cash	stock
Target x pre-ann.	0.767 (1.122)	0.268 (1.906)	1.838 ^b (0.720)	-0.091 (1.325)	-0.219 (0.842)	0.957 (0.815)	-0.501 (1.380)	3.113 (2.099)	0.936 (1.009)	-0.989 (1.950)	1.290 (0.806)	-2.363 ^b (1.165)
# observations	227	79	543	203	297	281	227	74	431	82	498	170
F	1.716 ^b	0.601	2.503 ^a	1.191	1.869 ^b	0.975	3.804 ^a	11.15 ^a	2.156 ^a	1.996 ^b	5.977 ^a	3.328 ^a
R ²	18.50%	16.00%	11.90%	21.40%	22.10%	13.10%	26.40%	69.80%	12.50%	53.00%	23.60%	30.30%
	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.
Target x pre-ann.	0.720 (1.019)	-0.901 (1.618)	1.599 ^b (0.734)	0.321 (1.184)	0.700 (0.701)	-0.942 (1.174)	-0.814 (1.471)	1.015 (1.844)	0.869 (1.172)	0.507 (1.425)	0.430 (0.946)	-0.411 (0.951)
# observations	265	56	607	156	436	142	202	120	286	227	329	331
F	1.696 ^b	3.576 ^a	2.449 ^a	0.878	1.220 ^c	1.192 ^c	3.749 ^a	3.304 ^a	2.166 ^a	2.118 ^a	3.419 ^a	3.323 ^a
R ²	15.70%	54.30%	9.70%	10.00%	15.00%	27.40%	28.90%	29.50%	15.40%	20.10%	23.70%	24.70%

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	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)			
	Low uncertainty						High uncertainty								
	Premium q5			Premium q1&2			Premium q5			Premium q3&4			Premium q1&2		
	strat.	fin.	target	bidder	target	bidder	strat.	fin.	target	bidder	target	bidder	strat.	fin.	target
Target x pre-ann.	0.228 (0.881)	0.088 (1.848)	1.313 ^c (0.733)	1.253 (1.285)	0.549 (0.693)	-0.522 (1.006)	-0.381 (1.392)	-0.602 (2.157)	0.456 (1.075)	2.333 (1.577)	0.287 (0.775)	-0.374 (1.306)			
# observations	316	40	597	149	484	94	227	76	343	170	464	207			
F	1.795 ^b	0.709	2.472 ^a	0.826	1.526 ^b	0.851	4.983 ^a	2.478 ^a	5.272 ^a	1.748 ^b	3.652 ^a	6.232 ^a			
R ²	10.90%	61.80%	10.20%	18.20%	13.70%	21.20%	32.10%	46.20%	22.80%	17.40%	22.40%	26.00%			
<i>Panel A2: After signing confidentiality agreement – completion probability</i>															
bidder	target	stock	cash	stock	cash	stock	bidder	target	cash	stock	bidder	target	cash	stock	target
0.307 (1.321)	1.164 (1.665)	1.164	1.977 ^b (0.907)	0.289 (1.078)	1.082 (1.029)	-0.034 (0.998)	-0.701 (1.312)	0.320 (1.758)	0.955 (1.011)	0.984 (1.371)	-0.247 (0.844)	0.334 (0.879)			
# observations	200	144	453	252	258	274	194	75	354	209	343	353			
F	1.420 ^c	1.606 ^c	3.442 ^a	1.562 ^b	1.714 ^b	2.257 ^a	2.969 ^a	33.44 ^a	1.411 ^c	1.772 ^b	1.909 ^a	2.653 ^a			
R ²	23.30%	20.70%	11.90%	15.90%	22.10%	21.00%	23.90%	69.30%	11.00%	20.90%	15.70%	24.30%			
cash	stock	stock	cash	stock	cash	stock	cash	stock	cash	stock	cash	stock			
0.996 (1.288)	1.164 (1.665)	1.164	1.453 ^c (0.748)	0.469 (1.906)	0.870 (0.859)	-0.258 (1.300)	-1.263 (1.309)	1.513 (2.208)	1.562 (0.977)	-0.566 (1.331)	0.753 (0.896)	-0.595 (0.782)			
# observations	261	144	608	94	392	140	170	93	374	189	391	308			
F	1.721 ^b	1.606 ^c	2.668 ^a	2.142 ^a	2.772 ^a	3.806 ^a	1.882 ^b	6.502 ^a	2.078 ^a	1.415 ^c	3.777 ^a	2.062 ^a			
R ²	16.20%	20.70%	9.40%	32.70%	20.50%	28.50%	28.00%	51.10%	14.70%	24.70%	21.00%	20.20%			
inf.sale	auc.	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.			
0.342 (1.311)	1.932 (1.741)	1.932	1.531 ^c (0.832)	0.865 (1.259)	0.729 (0.886)	0.335 (1.147)	-0.002 (1.185)	-2.979 (2.108)	1.309 (0.913)	-0.584 (1.659)	0.526 (0.770)	-1.367 (1.015)			
Target x pre-ann.	220	120	496	209	324	208	230	48	406	157	439	263			
# observations	1.857 ^a	2.213 ^a	2.414 ^a	1.399 ^c	1.627 ^b	4.228 ^a	2.209 ^a	9.843 ^a	1.510 ^b	2.062 ^a	2.100 ^a	2.158 ^a			
F	25.70%	25.10%	11.50%	14.30%	18.50%	26.20%	22.30%	61.30%	9.60%	32.20%	13.20%	26.70%			
R ²	strat.	fin.	strat.	fin.	strat.	fin.	strat.	fin.	strat.	fin.	strat.	fin.			
Target x pre-ann.	0.553 (1.184)	0.961 (1.785)	1.192 (0.807)	2.342 (1.416)	0.781 (0.812)	0.084 (1.410)	0.204 (1.228)	-2.790 (2.149)	0.822 (0.946)	0.976 (1.569)	-0.004 (0.682)	-0.905 (1.290)			
# observations	264	68	524	182	378	154	218	54	426	137	568	142			
F	1.866 ^a	23.20 ^a	2.793 ^a	1.557 ^b	2.119 ^a	2.674 ^a	3.326 ^a	2.148 ^a	2.029 ^a	1.303	3.122 ^a	1.170			
R ²	20.50%	49.10%	11.60%	16.60%	17.70%	32.00%	30.50%	55.20%	11.60%	23.70%	16.60%	27.60%			

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	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
	Low uncertainty						High uncertainty					
	Premium q5		Premium q3&4		Premium q1&2		Premium q5		Premium q3&4		Premium q1&2	
	bidder	target	bidder	target	bidder	target	bidder	target	bidder	target	bidder	target
Target x pre-ann.	1.910 ^b (0.950)	-0.279 (2.554)	0.146 (0.766)	-0.397 (1.403)	0.016 (0.864)	-1.806 ^c (1.026)	-0.223 (1.332)	-0.047 (1.888)	2.370 ^b (1.187)	0.958 (1.206)	0.764 (0.934)	0.554 (0.931)
# observations	260	80	535	222	446	347	183	115	274	239	367	409
F	3.175 ^a	2.484 ^a	3.330 ^a	3.977 ^a	4.886 ^a	3.820 ^a	1.348	5.171 ^a	1.344	2.440 ^a	2.039 ^a	2.974 ^a
R ²	18.10%	33.70%	15.50%	27.10%	16.70%	24.80%	24.10%	38.00%	13.70%	23.40%	13.20%	22.60%
	cash	stock	cash	stock	cash	stock	cash	stock	cash	stock	cash	stock
Target x pre-ann.	2.520 ^b (1.172)	-2.212 (2.001)	0.325 (0.785)	-1.149 (1.342)	-0.599 (0.957)	-1.145 (0.899)	0.622 (1.253)	0.350 (1.759)	1.879 ^b (0.936)	0.740 (1.707)	0.256 (0.793)	2.179 ^b (1.043)
# observations	227	79	543	203	437	356	227	74	431	82	600	185
F	3.819 ^a	3.586 ^a	3.969 ^a	1.675 ^b	3.986 ^a	2.013 ^a	2.990 ^a	2.110 ^b	2.352 ^a	0.857	3.774 ^a	5.995 ^a
R ²	21.20%	40.10%	18.90%	26.20%	21.60%	15.30%	28.00%	60.10%	14.10%	36.30%	14.50%	33.90%
	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.
Target x pre-ann.	1.055 (1.061)	2.569 (1.904)	0.428 (0.735)	-2.598 (1.620)	0.258 (0.735)	-3.826 ^a (1.398)	-0.303 (1.226)	0.704 (1.876)	1.000 (1.106)	2.388 ^c (1.281)	0.848 (0.845)	0.286 (0.980)
# observations	265	56	607	156	602	191	202	120	286	227	391	386
F	8.175 ^a	1.694 ^c	4.824 ^a	1.940 ^b	4.453 ^a	2.679 ^a	2.181 ^a	2.177 ^a	1.635 ^b	1.954 ^a	1.626 ^b	3.187 ^a
R ²	16.80%	50.00%	19.90%	19.10%	18.80%	31.70%	27.30%	31.70%	14.00%	22.20%	14.40%	22.20%
	strat.	fin.	strat.	fin.	strat.	fin.	strat.	fin.	strat.	fin.	strat.	fin.
Target x pre-ann.	0.989 (0.925)	5.176 (3.008)	0.115 (0.797)	-0.744 (1.138)	-0.648 (0.728)	-1.487 (1.667)	-0.064 (1.236)	-0.348 (1.947)	1.034 (1.015)	2.644 ^c (1.348)	0.585 (0.799)	0.686 (1.151)
# observations	316	40	597	149	663	130	227	76	343	170	536	252
F	2.329 ^a	2.230 ^b	4.387 ^a	2.922 ^a	4.607 ^a	1.205	3.335 ^a	1.534 ^c	3.012 ^a	2.731 ^a	2.284 ^a	2.609 ^a
R ²	10.60%	56.40%	17.30%	42.20%	18.60%	24.00%	27.70%	45.80%	21.80%	25.40%	12.20%	28.30%

Panel B1: Before signing confidentiality agreement – negotiation length

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	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)			
	Low uncertainty						High uncertainty								
	Premium q5			Premium q3&4			Premium q5			Premium q3&4			Premium q1&2		
<i>Panel B2: Before signing confidentiality agreement – completion probability</i>															
Target x pre-ann.	bidder	target	bidder	target	bidder	target	bidder	target	bidder	target	bidder	target			
	1.979 (1.218)	0.047 (1.720)	1.538 ^c (0.923)	-0.110 (1.311)	0.879 (1.096)	-0.451 (1.035)	0.606 (1.115)	-0.424 (2.201)	0.003 (0.865)	0.834 (1.343)	-0.074 (0.732)	-0.837 (0.948)			
# observations	200	144	453	252	346	334	194	75	354	209	472	414			
F	1.712 ^b	1.018	3.220 ^a	2.468 ^a	2.095 ^a	2.018 ^a	1.274	7.021 ^a	1.658 ^b	2.720 ^a	2.713 ^a	5.221 ^a			
R ²	22.60%	18.80%	14.20%	19.70%	16.20%	14.80%	15.80%	55.90%	16.00%	27.40%	11.50%	25.80%			
	cash	stock	cash	stock	cash	stock	cash	stock	cash	stock	cash	stock			
Target x pre-ann.	1.110 (1.279)	0.209 (1.759)	1.045 (0.864)	-1.230 (1.226)	-0.106 (0.878)	1.010 (1.398)	2.307 ^b (1.169)	0.047 (1.720)	0.970 (0.809)	0.434 (1.956)	-0.595 (0.858)	-0.546 (0.784)			
# observations	170	93	374	189	514	166	261	144	608	94	515	372			
F	10.02 ^a	2.092 ^a	4.252 ^a	1.734 ^b	2.394 ^a	1.616 ^b	1.939 ^a	1.018	3.675 ^a	1.073	5.065 ^a	3.002 ^a			
R ²	22.70%	36.10%	15.60%	34.10%	12.20%	24.70%	20.30%	18.80%	14.50%	25.90%	21.00%	15.50%			
	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.	inf.sale	auc.			
Target x pre-ann.	0.859 (1.304)	1.920 (1.546)	0.883 (0.884)	0.858 (1.467)	1.029 (0.925)	-1.500 (1.196)	0.221 (1.050)	1.342 (2.475)	0.140 (0.817)	0.438 (1.485)	-0.155 (0.664)	-1.206 (1.116)			
# observations	220	120	496	209	421	259	230	48	406	157	576	316			
F	2.202 ^a	1.419	2.977 ^a	3.190 ^a	2.731 ^a	1.813 ^a	1.690 ^b	5.560 ^a	2.432 ^a	3.097 ^a	3.803 ^a	3.266 ^a			
R ²	26.80%	34.40%	14.40%	22.30%	15.00%	18.00%	12.10%	53.30%	18.40%	27.20%	15.00%	26.30%			
	strat.	fin.	strat.	fin.	strat.	fin.	strat.	fin.	strat.	fin.	strat.	fin.			
Target x pre-ann.	1.505 (1.234)	0.465 (1.886)	0.918 (0.892)	0.815 (1.297)	0.087 (0.923)	0.623 (1.244)	0.306 (1.141)	2.076 (2.453)	-0.205 (0.850)	1.289 (1.318)	-0.615 (0.635)	-0.747 (1.522)			
# observations	264	68	524	182	486	194	218	54	426	137	717	183			
F	1.812 ^b	1.168	3.222 ^a	2.376 ^a	2.156 ^a	1.896 ^a	2.074 ^a	1.917 ^b	3.500 ^a	1.894 ^b	4.375 ^a	1.919 ^a			
R ²	17.20%	19.90%	14.80%	31.30%	12.40%	22.60%	18.50%	40.90%	22.60%	23.90%	16.00%	25.40%			