Does Target Firm Insider Trading Signal Synergies in Mergers and Acquisitions?

Inho Suk*
School of Management, SUNY-Buffalo
Korea University Business School

Mengmeng Wang
School of Management, SUNY-Buffalo

ABSTRACT

It is not ex ante clear whether target insider trading signals the target's synergy potential before a merger is agreed because target insiders do not have perfect information about the synergy potential of an acquirer that is under consideration. Further, target insider trading faces more stringent regulations before impending mergers and acquisitions (M&A) than it does before other corporate events, mainly due to the "Short Swing rule". We find that the acquirer and target's combined abnormal returns at the M&A announcement and operating performance after M&A increase in target firm insiders' pre-M&A net purchase ratios. Accordingly, target insiders' pre-M&A net purchase ratios are positively associated with takeover premium and cash payment likelihood of an acquisition, indicating that the acquirer indeed uses target firm insider trading to infer acquisition synergies. Altogether, these findings suggest that target insider trades prior to M&A play an active role in signaling synergy gains from acquisitions.

Keywords: insider trades; mergers and acquisitions; regulation; information asymmetry; signaling

JEL Classifications: G14 ; G34; M41; M48

* Corresponding author: Inho Suk
       342 Jacobs Management Center
       Buffalo, NY 14260-4000
       Email: inhosuk@buffalo.edu
       Phone: (716) 645-3215
       Fax: (716) 645-3823

I. INTRODUCTION

Prior studies document that corporate insiders' trading activities are used by investors to interpret and price forthcoming corporate events, such as dividend policy changes, seasoned equity offerings, managers' voluntary disclosures of innovation strategy, etc. (John and Lang 1991; Johnson, Serrano, and Thompson 1996; Gu and Li 2007; Badertscher, Hribar, and Jenkins 2011; Veenman 2012; Chen, Martin, and Wang 2013). However, the informational role and regulatory environment of insider trading prior to mergers and acquisitions (M&A) are quite different from those prior to other corporate events. In particular, because prior to an M&A target insider trading is subject to (1) target insiders' imperfect foreknowledge about the acquirer's synergy potential and (2) the Short Swing rule that severely curbs target insiders' trading, it is not ex ante clear whether target insider trading is able to signal the synergy potential of the target firm prior to an M&A agreement/announcement. Nonetheless, whether target insider trading prior to M&A signals synergies in M&A has not been explored. Our study fills this void in the literature.

The acquirer's takeover outcome depends on its estimation of the synergy created from a takeover of a potential target firm. To this end, the acquirer who is subject to adverse selection and overpayment strives to collect information about the target's synergy potential. But during the preliminary or early period of due diligence period — before the M&A announcement — the acquirer can only access the target's public disclosures and very limited private information provided by the target, which hinders the acquirer from effectively assessing the target's potential for synergy. Even under the ongoing due diligence process, target firm insiders, on the contrary, still have an information advantage over the acquirer in predicting future cash flows the target can create when it is acquired by another firm. Under such circumstances, target insider trading may be an important public information source for the acquirer because, as prior literature documents, insider trades predict their

firms' future cash flows and earnings (Seyhun 1992; Lakonishok and Lee 2001; Ke, Huddart, and Petroni 2003; Piotroski and Roulstone 2005) and abnormal returns (Jaffe 1974; Finnerty 1976; Seyhun 1986, 1992, 1998; Cohen, Malloy, and Pomorski 2012; Ryan, Tucker, and Zhou 2016). Prior studies also find that corporate insiders' trading activities are used by investors to infer the implications of various forthcoming corporate events. However, the informational implication of target insider trading for the success of future M&A may differ from the informative role of insider trading for other corporate events, because target insiders do not have precise information about whether the target and an acquirer that is under consideration/negotiation will effectively generate the synergy when they are combined.

Insider trading regulations of impending M&A also differ from those of other corporate events. In particular, Section 16b (known as the "Short Swing rule"), which requires any profits earned by insiders on a round trip within any six-month period to be paid back to the firm, is intended to curb insider trades prior to takeovers because takeover completion forces the sale of the target stock. Agrawal and Jaffe (1995) and Agrawal and Nasser (2012) find that the Short Swing rule deters target insider trading prior to M&A announcements. Facing any upcoming corporate events other than M&A, insiders can avoid the violation of the Short Swing rule simply by holding the stock over six months. However, upon takeover completion, target insiders are forced to sell the target stock, such that insider trading before M&A is severely restricted under the Short Swing rule. Given the uncertainty about merger completion, the Short Swing rule discourages target insiders from buying target stock before merger completion. Thus it can be argued that the target insider trading before M&A is unlikely to sufficiently embrace target insiders' private information even when target insiders are able to assess the synergy potential of the target firm. If this is the case, target insider trades before M&A may not play a role as a signal for the synergy gains from the acquisition of the potential target.

Suppose, on the contrary, target insiders have an informational advantage over the acquirer on the target firm's synergy potential. Under the Short Swing rule, target insider trades prior to takeovers are less subject to short-term basis trades but are more likely to play a role as a signaling mechanism for longer-term profitability. In this scenario, target insiders' pre-M&A trades signal synergy gains of acquisitions or post-acquisition profitability. Specifically, the observable equity transactions undertaken by target insiders prior to M&A help acquirers making more profitable acquisitions as well as efficient payment decisions. This signaling hypothesis brings forth three sets of testable predictions relating to synergy gains, takeover premium, and payment method. First, target insiders' net purchase ratio prior to the acquisition announcement is positively associated with the synergy created by the acquisition deal. Second, if the acquirer uses target firm insider trading to infer synergies in acquisitions, target insiders' net purchase ratio prior to the acquisition announcement is positively associated with takeover premium the acquirer pays. Finally, target insiders' net purchase ratio prior to the acquisition announcement is positively (negatively) associated with the percentage paid with cash (stock) by acquirers.[1]

We test the three hypotheses using 5,313 acquisitions that occurred among U.S. public firms during the period of 1/1/1987 to 12/31/2016 and insider trades made within a one-year period prior to public announcements of these acquisitions. For each acquisition, we calculate two measures of the target insiders' net purchase ratio (one measured with trading volume and the other with trading value) by aggregating target firm insider trades made within a one-year period before the M&A public announcement.

First, we find that the target insiders' net purchase ratio is positively associated with both expected synergy gains (measured as acquirer-target combined cumulative abnormal returns at the

---

[1] Prior studies suggest that a larger (lower) portion of stock (cash) payment indicates the acquirers' desire to protect themselves from overpayment and to mitigate information risk. This will be discussed in section II in more detail.

M&A announcement) and post-acquisition operating performance (measured as the change in three-year accounting earnings after the acquisition completion). This indicates that the information reflected in target insider trading prior to the M&A announcement serves as a credible signal for the acquisition outcome (i.e. synergy). Second, we find that target insiders' net purchase ratios have a positive impact on takeover premium paid by the acquirer that is measured as the offer price relative to the target's stock price and on the target's abnormal stock return at the M&A announcement. These results suggest that the acquirer, as well as investors, consider target insider trading as a signal when evaluating potential targets and synergies. Finally, we find that the ratio of stock (cash) payment is negatively (positively) related to the ratio of target insiders' net purchases. This implies that acquirers perceive target insiders' net purchase ratios as a signal for the target's potential in creating synergy gains, which mitigates valuation uncertainty about targets, thereby reducing acquirers' motives for stock payment to prevent overpayment.

We conduct a number of sensitivity analyses. For example, we replicate the main tests using alternative aggregation periods (i.e., each of the first six-month and last six-month period of the pre-M&A one-year period) for target insider trading and employing only target insiders' green window trading. We also address the endogeneity concern such as the omitted correlated variable bias (e.g., the combined M&A return could be caused by outsiders' reactions to other events rather than insiders' foreknowledge) or reverse causality (e.g., target insider trading could be made in anticipation of potential acquisitions) using an instrument variable approach. In addition, we repeat our analysis using *abnormal* insider trading and separate samples of insider *purchases* and *sales*. These sensitivity analyses yield consistent results with those from the main analyses, ensuring that our findings are robust to alternative specifications. Further, cross-sectional analyses reveal that the synergy signaling role of target insider trading prior to the M&A announcement is more pronounced when target

information environment is more asymmetric or less transparent, lending additional support to our signaling hypothesis. Overall, our findings in this paper indicate that deal synergies turn out to be better as target insiders' net purchase ratios before M&A are higher, suggesting that target insider trading is a signal for M&A synergy. Further, target insiders' pre-M&A trading activities are used as an information source by the acquirers and the market in interpreting and pricing the M&A event.

This paper contributes to the literature in several ways. First, our study adds to the literature that examines the informational implication of insider trading for numerous corporate events but has not examined its implication for the outcome of corporate mergers and acquisitions, possibly due to target (acquirer) insiders' uncertain foreknowledge about the acquirer's (target's) synergy potential and the stringent insider trading regulation prior to M&A. Our study is the first that examines the informational implication of target firms' pre-M&A insider trading for synergy gains from anticipated M&A. We provide strong evidence that the target firm insider trading acts as a public information source for the acquirer in assessing the target's synergy potential during the due diligence process, thereby elevating the outcome of the acquirer's acquisition decisions. Second, our study provides nuanced insights into the longstanding debate on insider trading regulation.[2] We examine the role of target firms' pre-M&A insider trading, which is severely regulated under the Short Swing rule (Section 16b), in mergers and acquisitions. Our evidence suggests that pre-M&A target insider trading, even under such a strong regulation, increases the M&A market efficiency by signaling synergy gains of M&As. Third, our findings have implications for a growing body of research that examines the effect of uncertainty about the synergy potential of target firms on M&A decisions and consequences while benefiting practitioners who consider acquisitions and attempt to reduce the risk of adverse selection and overpayment for target firms. Our evidence suggests that target insider trading patterns

---

[2] The literature on this debate is extensively discussed by Bhattacharya (2014).

provide useful guidance for bidders in selecting a target during the pre-negotiation stage to enhance the synergy gains and post-acquisition profitability.

The rest of the paper proceeds as follows. Section II reviews the related literature and develops hypotheses. Section III describes sample selection procedure and variable measurements. Section IV discusses empirical analyses and results, followed by additional and robustness tests in Section V. Section VI concludes the paper.

II. BACKGROUND AND HYPOTHESES DEVELOPMENT

II.1. Background

Information uncertainty around a target in M&A transactions

Prior literature has shown that opaque information environment around the target negatively affects acquirers' acquisition performance (e.g., Moeller, Schlingemann, and Stulz 2004, 2007; Morellec and Zhdanov 2005; McNichols and Stubben 2015). Erickson, Wang, and Zhang (2012) find that information uncertainty about target firms is a main factor for acquirers' post-acquisition wealth losses. Goodman, Neamtiu, Shroff, and White (2014) indicate that uncertainty about target candidates lowers acquisition quality by constraining the manager's ability to identify the most profitable investment projects. Amel-Zadeh and Zhang (2015) find evidence that deal value multiples (premiums received by targets) are significantly lower for restating targets than for non-restating targets because of the information risk associated with restating firms. Recently, a growing body of research examines the effect of target firm opacity on the quality of acquisitions or the post-acquisition profitability for the combined entity. For example, Cai, Kim, Park, and White (2016) show that a shared auditor, acting as an information intermediary, can help the acquirer reduce information uncertainty throughout the acquisition process and thus leading to higher quality acquisitions. Martin

and Shalev (2017) suggest that firm-specific information about a target reduces bidders' uncertainty about the target's common value and thus improves the efficiency of takeovers.

The above-mentioned studies collectively suggest that an informative signal about target candidates plays an important role in improving acquisition efficiency by facilitating acquirers' assessment of costs, benefits and economic surplus of the acquisition deals. During the due diligence process, acquirers gather information, evaluate the targets and the potential synergies, and verify the valuation before they assume all the risk of the combined business (Lajoux and Elson 2000; Copeland, Koller, and Murrin 2000; Bruner 2004; Cai et al. 2016). During the preliminary due diligence, the acquirer must rely exclusively on publicly available information as the basis for the decision to approach a potential target. Even during negotiations of initial deal terms after a candidate is selected and the due diligence review process begins, the acquirer is given only limited private information from the target (Skaife and Wangerin 2013; Ahern and Sosyura 2014; Amel-Zadeh and Zhang 2015).[3] Under such circumstances, the acquirer who is subject to the adverse selection and overpayment problems, strives to collect information about the synergy potential of the target firm to make efficient takeover decisions.

Informativeness and regulation of insider trading

Prior literature has documented that insider trading is informative about their firms' future cash flows or earnings. For example, Seyhun (1992) finds that aggregate open market insider sales and purchases predict up to 60% variation in one-year-ahead aggregate stock returns, which can be attributed to insiders' ability to identify changes in business conditions as well as movements away from fundamentals. Lakonishok and Lee (2001) show that corporate insiders are able to predict cross-

---

[3] After negotiations, decisions such as whether to make (or take) an offer, acquisition price (i.e. premium), deal structure, etc. are made, then acquisition agreements are signed and publicly disclosed. Next comes the transactional due diligence when acquirers continue to obtain private information and verify the accuracy of previous information and estimation till the deals are completed or withdrawn.

sectional stock returns. Ke et al. (2003) provide evidence that insiders possess and trade upon the knowledge of forthcoming accounting disclosures as long as two years prior to the disclosure. Piotroski and Roulstone (2005) find that insiders are both contrarians and possessors of superior information.

A branch of studies documents that under the presence of information asymmetry between corporate insiders and outsiders, observable insider trades act as an information source that allows investors to better interpret and price corporate events. For example, John and Lang (1991) present that preceding insider trades transfer information to market and impact market reaction at the announcement of a dividend policy change. Johnson et al. (1996) also find insider trading explains the subsequent announcement return of seasoned equity offerings. Gu and Li (2007) find that insider purchases enhance the credibility of a high-tech firm's voluntary disclosure of innovation strategies. Badertscher et al. (2011) find less (more) negative market reactions to accounting restatements when managers are net purchasers (sellers) of stock before the restatement and conclude that investors use prior insider trading in interpreting and pricing accounting restatement. Veenman (2012) notes that insider purchases not only signal future earnings information but also provide information about the valuation implication of past earnings news. In sum, these studies collectively suggest that when large corporate events involve uncertainty regarding firm value, the signal of management's private information excerpted from insider trading plays a role in resolving such uncertainty and facilitates investors' evaluation of firms. With respect to M&A, Meulbroek (1992) uses *illegal* insider trading data that identifies individuals charged with illegal insider trading by the SEC and examines the effect of insider trading on price run-up prior to M&A. She finds 50% of pre-MA announcement price run-up observed before M&A occurs on illegal insider trading days. Using the same data, Meulbroek and Hart (1997) find that takeovers with detected illegal insider trading have one-third higher target

abnormal returns around M&A announcements (which they define as takeover premium) than a control sample. However, whether pre-M&A *legal* transactions by target insiders signal *synergies* in M&A has not been studied in the literature.

Insider trading regulations by the Securities Exchange Act of 1934 and SEC rules (e.g., Section 10b, Rule 10b-5, Section 16a, Rule 14e-3, etc.) and various case laws (Seyhun 1992) deter insiders from opportunistically timing their trades prior to corporate events. Section 10b of the Act and SEC rule 10b-5 prohibit anyone from trading based on material, non-public information. Section 16a requires registered corporate insiders to report their trades to the SEC, and SEC rule Section 16b (the Short Swing rule) requires registered corporate insiders to return to the company any profit on round-trip trades (i.e. a purchase followed by a sale or vice-versa) made within a six-month period. The Section16b rule is relatively more effective in deterring insider trading prior to M&A than prior to other corporate events because merger completion forces the sale of all target stock, including stock held by insiders (Agrawal and Jaffe 1995). Consistent with the deterrence effect of this rule, Agrawal and Jaffe (1995) find a reduction in pre-announcement purchases by registered insiders of targets in mergers, based on a sample of 1941-1961. A more recent study by Agrawal and Nasser (2012) finds that registered insiders of target firms reduce their purchases before takeover announcements, but they reduce their sales even more by postponing sales for their diversification and/or liquidity needs, thus increasing their net purchases.

II.2. Hypotheses

Acquisition synergy

Our study extends the afore-mentioned literature by investigating whether target insiders' trading behavior plays a role as a signal for the target's synergy potential in M&A. At first glance, because target insiders have an informational advantage over outsiders regarding their firms'

prospects and insider trading has been found to be informative to outsiders, target insider trading may indicate synergy gains from acquiring them. In the case of M&A of which the information structure on future success is significantly different from other corporate events, however, it is not clear whether target insiders have the information about the synergy potential of the target firm before an M&A is announced because they do not have perfect information about whether an acquirer that is under consideration/negotiation as an M&A partner is a good match to create the synergy. Further, it can be argued that due to the Short Swing rule that discourages target insiders from buying target stock before merger completion given the uncertainty about merger completion, the target insider trading before M&A is unlikely to reveal target insiders' private information, thereby being unable to play a role as a signal effectively for the synergy effects from the acquisition of the potential target. Under this scenario, target insider trading does not have any significant implications for synergy gains.

On the contrary, some may argue that target insiders have an informational advantage over the acquirer on the synergy potential of the target firm. In addition, under the Short Swing rule, target insider trades prior to takeovers are less subject to short-term basis trades and are more likely to play a role as a signaling mechanism for longer-term profitability. This position postulates that target insider trading indicates the target's potential as an M&A partner in generating synergy gains which are measured as the abnormal returns to the combined entity upon acquisition announcement or post-acquisition accounting performance (will be discussed in detail in Section III). This signaling hypothesis can be stated as:

H1: Target insider net purchase ratio prior to the acquisition announcement is positively associated with synergy gains of the acquisition.

Takeover premium

We now examine whether the acquirer perceives target insiders' trading behavior before M&A announcement as a signal for the target's synergy potential and thus use it in payment decision

of the acquisition. One of the important topics in the context of M&A payment is takeover premium to be paid by the acquirer. Takeover premium is generally defined as the acquirer's excess offer price over the target's stock price. The offer price reflects the acquirer's valuation of the target as well as achievable synergies based on the knowledge of the target firm (Officer 2007; Amel-Zadeh and Zhang 2015). If target insiders' net purchase ratios are perceived by acquirers as a signal for the target's potential in creating synergy gains, acquirers would be more willing to buy this target at higher offer price over the target's stock price (i.e., payment premium). We, therefore, predict that the target insiders' net purchase ratio will be positively associated with the offer price relative to the target's stock price.

From the perspective of general investors, takeover premium is alternatively measured as the target's abnormal stock return at the M&A announcement (Meulbroek and Hart 1997), which indicates target investors' expectations about the target's synergy potential in term of the takeover deal. If the target insiders' net purchase ratio is high before the M&A announcement and is taken by the market as a signal for the target's promising future associated with the M&A deal, a target with a higher insider purchase ratio will elicit a more positive and larger market reaction (i.e., abnormal return) at the M&A announcement.

Overall, if target insiders' net purchases signal synergy gains from acquiring the target and enhance the acquirer's (investors') valuation of the target firm, they will be positively associated with takeover premium. They may not, however, if they do not play the signaling role or the acquirer (investors) does not consider target insiders' net purchases as such a signal. Thus, under the signaling hypothesis, the second hypothesis can be offered as:

H2: Target insider net purchase ratio prior to the acquisition announcement is positively associated with takeover premium.

Method of M&A payment

Prior studies (e.g., Fishman 1989; Eckbo, Giammarino, and Heinkel 1990) document that if all agents in markets are symmetrically informed, the payment method should be irrelevant because the level of gains created by acquisitions and division of these gains between acquirers and targets do not rely on the method of payment. But when it comes to information asymmetry and valuation uncertainties, as Hansen (1987) argues, a stock offer could protect acquirers from overpayment and mitigate information risk (uncertainty) about the target. Accordingly, Officer, Poulsen, and Stegemoller (2009) provide empirical evidence that the use of a stock-swap mitigates information uncertainty with regards to the target thereby increasing the returns to acquirers when there is substantial informational asymmetry about the value of the target. Raman, Shivakumar, and Tamayo (2013) demonstrate that acquirers are more likely to use stock as the payment medium of takeovers when the target's financial reporting quality is low.

If target insiders' net purchases signal the target's potential in creating synergy gains and thus elevate acquirers' confidence about an M&A deal with target firms with high insider net purchases while facilitating the acquirer's estimation of intrinsic values of potential target firms, they will mitigate valuation uncertainty about targets, reducing acquirers' motive for stock payment. If this is the case, acquirers would be more willing to pay target firms having higher (lower) insider net purchase ratios by cash (stock) than stock (cash).[4]

H3: Target insider net purchase ratio prior to the acquisition announcement is positively (negatively) associated with cash (stock) payment likelihood of the acquisition.

III. VARIABLE MEASUREMENTS AND SAMPLE CONSTRUCTION

---

[4] This argument is congruent with the literature on the relation between over- or under-valuation of the target and the payment method of M&A. Prior studies (Eckbo et al. 1990; Malmendier, Opp, and Saidi 2016) suggest that the overvaluation of the target firm leads the acquirer to use stock instead of cash as payment medium while its undervaluation promotes the acquirer to pay cash. Because insider purchases (sales) are more (less) likely to occur when a firm is undervalued whereas insider sales (purchases) are more (less) likely to occur when a firm is overvalued, high (low) net insider purchases could be a signal for target undervaluation (overvaluation), leading the acquirer to pay by cash (stock).

III.1. Variable Measurement

Net insider purchases

Following the literature, we construct two net insider purchase variables — the volume-based net insider purchase ratio (*NIP*) and the value-based net insider purchase ratio (*NVIP*), for each acquisition deal using target firm *i*'s aggregate insider purchases and sales within one year, i.e. from -365 to -1 day, before the M&A announcement (i.e., -365 to -1).[5] Similar to Agrawal and Nasser (2012), we choose a 365-day window, which generally encompasses both pre-negotiation and negotiation periods (Ahern and Sosyura 2014), for two reasons. First, most takeover talks appear to begin within a one-year period before the first public announcement of a takeover, with substantial cross-sectional variation in the length of this interval. Second, both potential acquirer and target do not know ex ante either whether the candidate is selected as the target or when the M&A is complete.[6]

First, we obtain *NIP* using the number of shares purchased and sold by target firm insiders as in the following formula:

$$NIP_{i,(t\text{-}365day,t\text{-}1day)} = \frac{[Purchase_{i,(t-365day,t-1day)} - Sold_{i,(t-365day,t-1day)}]}{[Purchase_{i,(t-365day,t-1da\ )} + Sold_{i,(t-365day,t-1day)}]} \qquad (1\text{-}1)$$

Purchase (*Sold*) is the number of shares purchased (sold) by target firm *i*'s top executives through open markets and subscript *t* is the M&A announcement date (from the Securities Data Corporation's (SDC) U.S. Mergers and Acquisitions database).

In addition to the volume-based insider trading measure, similarly, we use a value-based one:

$$NVIP_{i,(t\text{-}365day,t\text{-}1day)} = \frac{[VPurchase_{i,(t-365day,t-1da\ )} - VSold_{i,(t-365day,t-1day)}]}{[VPurchase_{i,(t-365day,t-1day)} + VSold_{i,(t-365day,t-1day)}]} \qquad (1\text{-}2)$$

---

[5] Because we are interested in aggregate insider trades per acquisition to test the signaling hypothesis, the *net* purchase measure is meaningful rather than separate measurements of purchases and sales.

[6] Later, we divide the pre-M&A one-year period into two sub-periods: the first six months (i.e. -365 days to -180 days) and the second six months (i.e. -180 to -1 days) before the deal announcement. We then separately calculate net insider purchase ratios and repeat analyses for each of the six-month periods. We discuss this in more detail in Section V.1.

VPurchase (VSold) is the value of shares purchased (sold) by firm *i*'s top executives through open markets. Since we aggregate every target firm's insider trades for each M&A deal over the period from one year before the M&A announcement to one day before the announcement, by construction a positive *NIP* or *NVIP* indicates more purchases than sales during the one-year period while its negative value means insider sales are more than purchases during the same period.[7]

Acquisition synergy

We measure acquisition synergy in two ways: (1) one as the combined (i.e., acquirer and target) cumulative abnormal returns (CAR) around the acquisition announcement (*Com_CAR*) and (2) the other as the change in accounting performance of the merged entity after the acquisition completion from acquirer and target value-weighted accounting performance before the acquisition announcement.

The combined CAR of acquirer and target at the merger announcement is a reliable measurement of value creation or destruction by acquisition for shareholders (Andrade et al. 2001). Accordingly, a number of studies (e.g., Betton, Eckbo, and Thorburn 2008; Barraclough, Robinson, Smith, and Whaley 2013) use the combined CAR to measure acquisition synergy. To combine CAR of acquirer and target, we employ two approaches. The first combining approach calculates the combined CAR (*Com1_CAR*) by value-weighting acquirer's three-day (-1, +1) CAR and target's 22-day (-20, +1) CAR, following Martin and Shalev (2017) in which the weights are applied with the relative market values of the acquirer and target 60 days prior to the acquisition announcement. The abnormal return is measured by the prediction errors from (1) the market-model (*Com1_CAR1*) and (2) the Carhart four-factor model (*Com1_CAR2*), where the models' parameter estimates are obtained

---

[7] *NIP* includes zero-value *NIP* cases. Some may argue that firms with non-zero *NIP* are systematically different in characteristics from firms with zero *NIP* which could lead to our findings. We thus replicate our analyses with the sample that only includes non-zero *NIP* (*NVIP*) after dropping the observations with zero *NIP* (*NVIP*). The result from the non-zero *NIP* (*NVIP*) sample does not alter our inferences.

using the CRSP value-weighted market return with estimation periods ranging from 300 days to 60 days prior to the M&A announcement date (i.e., -300, -60). Similarly, in the second combining method, we measure the combined CAR (*Com2_CAR*) by value-weighting the acquirer's three-day (-1, +1) CAR and the target's three-day (-1, +1) CAR, which results in *Com2_CAR1* from (1) the market-model and (2) *Com2_CAR2* from the Carhart four-factor model.

The second acquisition synergy measure is the change in long-term accounting performance (*ΔROA*) after M&A as used in prior studies (e.g., Healy, Palepu, and Ruback 1992; Andrade, Mitchell, and Stafford 2001; Martin and Shalev 2017). This measure captures whether the expected synergies or gains at the acquisition announcement are actually realized as operating performance after the acquisition is complete. This measure is important since if mergers truly create value for shareholders, the value creation should be eventually realized as the combined firms' cash flows after acquisition (Andrade et al. 2001). *ΔROA* is calculated by the change in the three-year weighted average of (combined entity's) ROA after the acquisition completion from the three-year average of (acquirer and target value-weighted) ROA before the acquisition announcement. Specifically,

$$\Delta 3yrROA = Post\_3yr\_avgROA_{com} - Pre\_3yr\_avgVWROA \qquad (2)$$

In equation (2), *Pre_3yr_avgVWROA* is the average of the acquirer and target's ROAs over three years before the announcement year, weighted by their corresponding market value 60 days prior to announcement day. The variable, *Post_3yr_avgROA$_{com}$*, is the average of the combined firm's ROA over three years after the acquisition completion. We alternatively use industry-adjusted ROA, measured as the firm's ROA minus the median of ROAs of firms in the same two-digit SIC code to obtain industry-adjusted three years' average ROA change (*Δ3yrAdjROA*), which is measured as the change in the three-year average of industry-adjusted (combined entity's) ROA after the acquisition

completion (*Post_3yr_avgAdjROA_{com}*) from the 3 years' average of industry-adjusted (acquirer and target value-weighted) ROAs before the acquisition announcement (*Pre_3yr_avgVWAdjROA*).[8]

Takeover premium

Following previous studies, we primarily measure takeover premium using the acquirer's offer price over the target stock price and use three measures: *Prem4W*, *Prem1W*, and *Prem1D*, which are defined as the acquirer's offer price over the target firm's closing stock price four weeks, one week and one day prior to the acquisition announcement date, respectively. Specifically, they are measured as:

$$Prem4W = \frac{(Offer\ price - Target\ Closing\ Stock\ Price\ 4\ weeks\ before\ announcement\ day\ )}{Target\ Closing\ Stock\ Price\ 4\ weeks\ before\ announcement\ day} \quad (3\text{-}1)$$

$$Prem1W = \frac{(Offer\ price - Target\ Closing\ Stock\ Price\ 1\ week\ before\ announcement\ day\ )}{Target\ Closing\ Stock\ Price\ 1\ week\ before\ announcement\ day} \quad (3\text{-}2)$$

$$Prem1D = \frac{(Offer\ price - Target\ Closing\ Stock\ Price\ 1\ day\ before\ announcement\ day\ )}{Target\ Closing\ Stock\ Price\ 1\ day\ before\ announcement\ day} \quad (3\text{-}3)$$

We additionally measure the target firm's cumulative abnormal returns (CAR) around the M&A announcement date. To measure the target CAR at the announcement, we first obtain targets' expected returns using two models: market model (*CAR1*) and Carhart four-factor model (*CAR2*) in which the CRSP value-weighted market return is used with estimation periods ranging from 300 days to 60 days prior to the M&A announcement date (i.e., -300, -60). To cumulate abnormal returns surrounding the announcement date, we use two commonly used event windows. The first window, as used in Andrade et al. (2001), is the three days surrounding the merger announcement, i.e., from one day before to one day after (-1, +1) the announcement (*Tgt_3dCAR1*, and *Tgt_3dCAR2*). Second, to take into account the possibility of information leakage about the upcoming acquisition, we use a

---

[8] We subtract *Pre_3yr_avgVWROA* (or *Pre_3yr_avgVWAdjROA*) because our focus is on *synergies* created from an acquisition.

longer window, as used in Martin and Shalev (2017), which begins 20 days prior to the announcement and ends one day after the merger announcement (*Tgt_22dCAR1*, and *Tgt_22dCAR2*).

III.2. Sample Selection

We collect insider trading data from the Thomson Reuters Insider Filing dataset for the period of January 1, 1986 to December 31, 2016. Our sample period begins in 1986 because corporate insider trading data are largely available since 1986 from Thomson Reuters. Following prior studies (Cheng and Lo 2006; Huddart and Ke 2007; Huddart, Ke, and Shi 2007; Rogers 2008; Veenman 2012), we focus on open market purchases and sales (with general transaction code of "P" or "S") reported in table 1 of form 4 made by firm executives (i.e., the chief executive officer, chief financial officer, chairman, president, or chief operating officer), because executives trades predict returns better than trades by nonexecutives and non-officer insiders are less likely to possess private information (Seyhun 1998). We exclude share purchases through any option exercises since these transactions are highly correlated with the sale of stock acquired on exercise of stock options (Ofek and Yermack 2000). Then we delete all observations with Thomson cleanse code "A" ("numerous missing or invalid data elements") or "S" ("security did not meet collection requirements") as well as observations with incomplete data. This procedure leaves us with a total of 1,035,898 individual-transaction observations.

From the Securities Data Corporation's (SDC) Mergers and Acquisitions database, we collect M&A deals that have occurred between US public acquirers and targets from January 1, 1987 to December 31, 2016.[9] Our sample period for acquisitions begins in 1987 because corporate insider trading data are largely available since 1986 from Thomson Reuters. The restriction to public

---

[9] In this step, we exclude share repurchases, privatizations, exchange offers, remaining interests acquisition, certain assets acquisition, spin-offs, split-offs, recapitalizations, hostile takeovers, and bids with missing data on the amount of target equity sought.

acquirers and targets assures the availability of insider trading and other required financial data, yielding 6,964 acquisition announcements. To ensure that the economic impact of the acquisition is nontrivial, we exclude acquisitions with a deal value less than $1 million and acquisitions that are less than one percent of the acquirer's pre-acquisition market value. We also require that the acquirer's pre-acquisition ownership is less than 20 percent of the target and seeks to purchase more than 50 percent of a public target, such that the acquirer does not have access to private information about the target before the bid and attempts to gain the control over the target after the acquisition.[10] These requirements reduce the sample to 6,293 acquisition transactions.

We merge the sample of 6,293 acquisition transactions with insider trading sample that contains the 1,035,898 observations, including target firms' all insider trades over the period of one year before the acquisition announcement, which yields 19,912 individual insider trading transactions.[11] Then we aggregate these transactions by each acquisition announcement. If there is no insider trade during the aggregating period (e.g., a one-year period before the acquisition announcement) but the firm has at least one insider trading transaction during the whole sample period, then we set the value for *NIP* and *NVIP* as zero.[12] These requirements reduce the sample that contains 5,313 acquisition observations. Across various empirical tests, the sample size varies depending upon the data availability of the experimental and control variables required for each empirical model. Table1, Panel A presents the details of our sample selection process.

Panel B of Table 1 displays the sample distribution by the M&A announcement year. Consistent with the temporal distribution of mergers and acquisitions reported in the literature (e.g.,

---

[10] Some studies require that the acquirer's pre-acquisition ownership be less than 50 percent of the target. We instead require the 20% threshold because in testing the signaling hypothesis, it is important to minimize the possibility that the acquirer has access to private information about the target before the bid.

[11] Our results are not sensitive when we drop insider trades that are ex post charged as illegal trading by the SEC.

[12] We exclude firms that have not reported any insider trading activity during the whole sample period to ensure that all firms in our sample are covered by the Thompson Financial insider trading database.

Holmstrom and Kaplan 2001; Martin and Shalev 2017), many takeover events occurred in the mid-1990s through late 1990s, and reached an all-time peak in years 1997–1999, although none of the years by itself accounts for more than 8% of the full sample. During the recent financial crisis, M&A activities have shrunk significantly. These M&A waves are consistent with the macroeconomic cycles.

III.3. Descriptive Statistics

Table 2, Panel A presents summary statistics for the final merger and acquisition sample before we require control variables to be available for each regression analysis. On average, target insider net purchase ratios (*NIP* and *NVIP*) are below zero, consistent with the notion that corporate insiders' sales are usually greater than purchases because they periodically receive stock compensation and, as a consequence, often sell their own stocks for liquidity or diversification reasons. The average of acquirer 3-day (-1, +1) and target 22-day combined CARs (*Com1_CAR*) is 2.3% while the average of acquirer 3-day (-1, +1) and target 3-day combined CARs (*Com2_CAR*) is 1.6%. The average of excess offer price over target market price (*Prem4W*, *Prem1W*, and *Prem1D*) ranges 34% to 44%, and average target cumulative abnormal returns (*Tgt_CAR*) are 26% and 21% for 22-day (-20, 1) and 3-day (-1, +1) windows, respectively. All these values are similar to those from previous studies. Andrade et al. (2001), for example, report combined *CAR*s of 1.9% and 1.8%, respectively, and they report excess offer price over target market price of 37.9% and target 22-day and 3-day *CAR*s of 23.8% and 16%, respectively, for their M&A sample that encompasses period 1973-1998. The percentage of stock payment is 55% while about 34% of deals are paid with more than 50% of cash. Turning to control variables, acquirer, target, and deal characteristics are comparable with previous studies. For example, the average level of leverage is around 0.21 for both acquirers and for targets, which is similar to 0.25 reported by Wang and Xie (2009) for both acquirers and targets.

Table 2, Panel B reports correlation coefficients between target insider trading measures and the dependent variables used in the regression analysis. Both *NIP* and *NVIP* are positively correlated with the synergy measures – the combined *CAR* around the M&A announcement date and changes in industry-adjusted return on assets after deal completion, which provides preliminary evidence on the positive association between target firm insiders' net purchase and acquisition profitability.[13] Both measures of target insider net purchases (*NIP* and *NVIP*) are also positively correlated with all types of takeover premium measures, indicating that target insider purchases promote acquirer's positive valuation about the target or deal value. The two net purchases variables are negatively correlated with the percentage of stock payment of acquisition but positively correlated with the likelihood of cash payment.

IV. EMPIRICAL ANALYSIS

IV.1. Acquisition Synergy

Combined cumulative abnormal returns around the announcement date

To test whether the target insiders' net purchase ratio before acquisition announcement is positively associated with the synergy created by the acquisition deal (H1), we first use the abnormal stock market *return* to the acquirer-target combined (i.e., market value-weight averaged) entity upon acquisition announcement (*Com_CAR*), which is expected to capture expected gains or synergies created from the acquisition (Andrade et al. 2001). Then we implement the following regression:

$$Com\_CAR = \beta_0 + \beta_1 NIP(or\ NVIP)_{i,(t\text{-}365day,t\text{-}1day)} + \sum \beta_j Acquirer\_Control_j$$
$$+ \sum \beta_i Target\_Control_i + \sum \beta_k Deal\_Control_k + \sum \gamma_t Year_t + \sum \tau_l Industry_l + \varepsilon \quad (4)$$

---

[13] As in many studies, however, combined CARs and post-acquisition ROA changes are not strongly correlated. Several studies (e.g., Heron and Lie 2002) attempt to explain the weak correlation between them based on various reasons, such as (i) investors' prediction errors or (ii) a longer forward-looking horizon of return compared to that of ROA.

The dependent variable, *Com_CAR*, is computed in four ways (*Com1_CAR1, Com1_CAR2, Com2_CAR1,* and *Com2_CAR2*) as described in Section III. If insider net purchases signal synergy gains of acquisition, the coefficient β_1 is expected to be positive.

As in conventional M&A studies, control variables, which may affect or signal synergy gains from M&A, include three categories: acquirer characteristics (*Acquirer_Controls*), target characteristics (*Target_Controls*), and deal characteristics (*Deal_Controls*). Both acquirer and target characteristics are measured at the end of the fiscal year that precedes the acquisition announcement year unless specified otherwise. Following the literature (Lang, Stulz, and Walkling 1991; Moeller et al. 2004; Dong, Hirshleifer, Richardson, and Teoh 2006; Bauguess, Moeller, Schlingemann, and Zutter 2009; Harford, Humphery-Jenner, and Powell 2012; Martin and Shalev 2017), the control set of acquirer characteristics (*Acquirer_Controls*) encompasses firm size (*Acq_SIZE*), market-to-book ratio (*Acq_MTB*), financial leverage (*Acq_LEV*), ROA (*Acq_ROA*), and free cash flow (*Acq_FCF*). Analogously, the target characteristics (*Target_Controls*) include firm size (*Tgt_SIZE*), market-to-book ratio (*Tgt_MTB*), financial leverage (*Tgt_LEV*), ROA (*Tgt_ROA*), past market return (*Tgt_RUN-UP*), and percentage of institutional ownership (*Tgt_BLOCK*). For example, we control for the target firm's market return (*Tgt_RUN-UP*) over the period of (-400,-40) days before the acquisition announcement to account for the effect of the target price run-up that could immediately occur following target insider trades (Keown and Pinkerton 1981; Meulbroek 1992). We also include the target's market-to-book ratio (*Tgt_MTB*) to control for the effect of undervaluation of the target firm on synergy gains of acquiring the target firm.

The control set of deal characteristics (*Deal_Controls*) includes a tender offer indicator (*TENDER*), the percentage of stock payment (*Pct_STOCK*), an indicator of different industries (*DIFFIND*), the relative size of deal value to acquirer market value (*Rel_SIZE*), and a multiple bidder

indicator (*MULBIDDER*). We add year and industry fixed effects to control for acquisition waves, any macroeconomic trends, and industrial variations in acquisition returns.[14] Standard errors are clustered by acquirer firm to correct for within-firm dependence and heteroscedasticity. The definitions of all variables are detailed in Appendix A.

Regression results are reported in Table 3. Both volume-based (*NIP*) and value-based (*NVIP*) net purchase ratios prior to the acquisition announcement are positively associated with all of the combined cumulative abnormal returns around the announcement date at least at the 5% significant level. Especially, models (1) - (4), in which the combination of 3-day acquirer *CAR* and 22-day target *CAR* are used, show stronger effects of *NIP* and *NVIP* than models (5) - (8) where the combination of 3-day acquirer *CAR* and 3-day target *CAR* are used. This is consistent with the phenomenon of information leakage prior to the M&A deal announcement. Overall, the results in Table 3 suggest that target insiders' pre-M&A trading spells the acquirer-target combined cumulative abnormal returns at the M&A announcement.

Changes in accounting performance

We next explore the association between target insider net purchase ratios (*NIP* and *NVIP*) and changes in average long-term (3-year) accounting profitability (i.e., ROA) of the post-M&A combined entity from the market value-weighted acquirer-target 3-year average of pre-M&A ROA (*ΔROA*). If the findings in Table 3 suggest that target insider net purchases manifest a positive signal for synergy gains and thus result in larger shareholder value creations for the combined entity at the acquisition announcement, a natural question follows: Are the gains eventually realized as the firms' cash flows (accounting performance)? This analysis is particularly important because, similar to prior

---

[14] Following most studies on M&A performance and properties, our study does not use firm fixed effects regressions because the sample does not have a panel structure that requires each firm to have a sufficient number of M&A deals over the sample period.

studies, Table 2, Panel B shows the combined *CAR* and ROA changes are not strongly correlated. We estimate the following regression model:

$$\Delta ROA = \beta_0 + \beta_1 NIP(\text{or } NVIP)_{i,(t-365day,t-1day)} + \sum \beta_j Acquirer\_Control_j$$
$$+ \sum \beta_i Target\_Control_i + \sum \beta_k Deal\_Control_k + \sum \gamma_t Year_t + \sum \tau_l Industry_l + \varepsilon \qquad (5)$$

The dependent variable, *ΔROA*, is measured as changes in average *ROA* (*Δ3yrROA*) or industry-adjusted average *ROA* (*Δ3yrAdjROA*) over 6 years around the M&A announcement and completion, as explained in Section III. If target insider net purchases manifest a positive signal for synergy gains that are eventually realized as the firms' cash flows, the coefficients of *NIP* and *NVIP*, in equation (5) are expected to be positive. Control variables are the same as those used in the combined CAR tests, with an exception of adding additional controls for prior year's acquirer *ROA* and target *ROA*. We control for prior years' acquirer-target market value-weighted average *ROA* (*VWROA*) as in Martin and Shalev (2017). Similar to previous analyses, year fixed effects are included and standard errors are clustered within acquirer firm. We note that no industry fixed effects are included in the regression when the dependent variable is the change of industry-adjusted *ROA* (*Δ3yrAdjROA*) whereas acquirer's industry fixed effects are included in the regression where the dependent variable is the change in *ROA* (*Δ3yrROA*).

The regression results presented in Table 4 support our predictions. In models (1) and (2) where the dependent variable is the industry-adjusted *ROA* change (*Δ3yrAdjROA*), the coefficients on target insider net purchase ratios (*NIP* and *NVIP*) are positive (0.00859 and 0.00845, respectively) and significant at the 5% level. When we replace the industry adjusted *ROA* change with the non-adjusted *ROA* change (*Δ3yrROA*) and control for the acquirer's industry fixed effects as seen in models (3) and (4), the coefficients on *NIP* and *NVIP* continue to be positive (0.00753 and 0.00733, respectively) and significant at the 5% level. Economically, increasing *NIP* (*NVIP*) by one standard deviation raises the industry-adjusted ROA (*Δ3yrAdjROA*) and the non-adjusted ROA (*Δ3yrROA*) by 0.52% (0.51%)

and 0.45% (0.44%), respectively. In sum, consistent with our prediction, the findings in Table 4 indicate that both target insider net purchase volume (*NIP*) and value (*NVIP*) ratios prior to the acquisition announcement are positively associated with the change in accounting performance after the acquisition, suggesting target firm insider trading helps the acquirer to choose a target with higher M&A profitability.

IV.2. Takeover Premium

The acquirer's offer price over the target stock price

In H2, we argue that targets with higher insider purchase ratios obtain larger premiums because acquirers would be more willing to buy this target at higher offer price or premium. To test this, we regress each of the three takeover premium measures (*Prem4W*, *Prem1W*, and *Prem1D*) on each of the pre-M&A net purchases measures (*NIP* and *NVIP*) and control variables. Specifically, we estimate the following regression model:

$$Premium = \beta_0 + \beta_1 NIP(or\ NVIP)_{i,(t\text{-}365day,t\text{-}1day)} + \sum\beta_j Acquirer\_Control_j$$
$$+ \sum\beta_i Target\_Control_i + \sum\beta_k\ Deal\_Control_k + \sum\gamma_t Year_t + \sum\tau_l Industry_l + \varepsilon \qquad (6)$$

The dependent variable, *Premium*, represents *Prem4W*, *Prem1W*, or *Prem1D* and the variable of interest is *NIP* (*NVIP*). In the context of H2, we expect the coefficient β_1 to be positive.

Considering that takeover premium largely depends on the acquirer's decision, we first control for the acquirer's characteristics, including acquirer size (*Acq_SIZE*), market to book ratio (*Acq_MTB*), leverage (*Acq_LEV*), free cash flows (*Acq_FCF*), and returns on assets (*Acq_ROA*). We control for year and industry fixed effects on bid premiums (Palepu 1986; Harford 2005). We also control for target characteristics, such as firm size (*Tgt_SIZE*), market-to-book ratio (*Tgt_MTB*), earnings-to-price ratio (*Tgt_EP*), leverage (*Tgt_LEV*), sales growth rate (*Tgt_SGROW*), returns on assets (*Tgt_ROA*), and the percentage of institutional ownership (*Tgt_BLOCK*). Following Ambrose and Megginson (1992), Berger and Ofek (1996), and Amel-Zadeh and Zhang (2015), we control for

tangibility of assets (*Tgt_TANG*), measured by the portion of tangible assets, and liquidity which is the portion of liquid assets (*Tgt_LIQ*). To account for the effect of the target price run-up, which could stem from target insider trades, on takeover premium (Meulbroek and Hart 1997), we control for the target firm's past market return (*Tgt_RUN-UP*).

Following prior literature that examines the determinants of takeover premiums (Schwert 2000; Raman et al. 2013; Amel-Zadeh and Zhang 2015), we include controls for deal characteristics, such as: *TENDER* which is equal to 1 if the deal is categorized as a tender offer in SDC dataset, 0 otherwise; *MULBIDDER* that equals 1 if the number of bidders reported by SDC is more than one and 0 otherwise; *DIFFIND* that equals 1 if the acquirer and the target have different two-digit SIC industry classification codes and 0 otherwise; and *REL_SIZE* which is measured as the ratio of the total transaction value to the market value of the acquirer 60 days before the acquisition announcement.

Table 5 presents the results from estimating equation (4). Models (1), (3) and (5) contain the results when target insider net purchases are measured using insider trading volume (*NIP*) while models (2), (4) and (6) display the results when they are calculated using insider trading value (*NVIP*). Consistent with H2, all three offer price-based premium measures (*Prem4W, Prem1W,* and *Prem1D*) are positively related to both trading volume (*NIP*) and value (*NVIP*)-based measures of target insider net purchase ratios at the 1% level. As seen in models (3) and (4), for example, the relation between the premium paid over target stock price 1 week ago (*Prem1W*) and target insider net purchase ratios is significantly positive, with the coefficients of *NIP* and *NVIP* being 0.0510 and 0.0483, respectively. The association between target insider net purchase ratios and the premiums they received from acquirers is also economically significant. For example, a one-standard deviation increase in *NIP* (*NVIP*) increases the premium paid over target stock price 4 weeks ago (*Prem4W*), 1 week ago

(*Prem1W*) and 1 day ago (*Prem1D*) by 2.84% (2.70%), 3.07% (2.91%), and 2.66% (2.51%), respectively.

These results indicate that acquirers are willing to offer higher premiums when target insiders purchase more (or sell less) of their own company stocks, which appears to enhance the acquirer's confidence in taking over the target. The coefficients on control variables are generally consistent with the findings in prior studies. For example, larger acquirers, smaller targets, deals involving multiple bidders, and tender offer deals lead to higher bid premiums, consistent with Schwert (2000), Bargeron, Schlingemann, Stulz, and Zutter (2008), and Raman et al. (2013).

Target's Cumulative Abnormal Returns around acquisition announcements

Using the target's abnormal returns around the M&A announcement as an alternative measure for takeover premium, we examine the effect of target net purchases prior to M&A announcements on the target firm's abnormal returns announcement by estimating the following regression:

$$Tgt\_CAR = \beta_0 + \beta_1 NIP(or\ NVIP)_{i,(t-365day,t-1day)} + \sum \beta_j Acquirer\_Control_j + \sum \beta_i Target\_Control_i$$
$$+ \sum \beta_k Deal\_Control_k + \sum \gamma_t Year_t + \sum \tau_l Industry_l + \varepsilon \qquad (7)$$

The dependent variable, target cumulative abnormal returns (*Tgt_CAR*), represents *Tgt_22dCAR1*, *Tgt_22dCAR2, Tgt_3dCAR1* or *Tgt_3dCAR2* (defined in Section III and Appendix A), and the variables of interest are *NIP* and *NVIP*. Given H2, β_1 is expected to be positive. We control for the same sets of acquirer characteristics, target characteristics and deal characteristics as in the offer price-based premium analysis. Unlike the payment premium test, however, since this test is to examine the market valuation of target shares, we control for *target* industry fixed effects and cluster the standard errors within the *target* firm to correct for within-firm dependence.[15] Again, control variables for

---

[15] When we use acquirer industry fixed effects and acquirer firm-clustered standard errors instead, the results are not sensitive.

acquirer and target firm characteristics are measured at the end of the fiscal year before the acquisition announcement year.

Table 6 presents the regression results. For the target 3-day (-1, +1) *CAR,* the coefficient on *NIP* is 0.0243 (t = 3.100) when the market model is used in computing CAR and it is 0.0239 (t = 3.072) when the Carhart four-factor model is used. Meanwhile, the coefficient on *NIP* is 0.0318 (t = 3.594) and 0.0315 (t = 3.527) for the target 22-day (-20, +1) market-model CAR and for the target 22-day four-factor model CAR, respectively. The coefficients on *NVIP* are similar to those on *NIP*, albeit slightly smaller. Based on the assumption that the target's M&A announcement abnormal returns represent market's interpretation about the target firm's potential post-acquisition, the observed positive effect of target insiders' net purchase volume (*NIP*) and value (*NVIP*) on the target's M&A announcement abnormal returns implies that target insider's net purchases are a positive signal about post-acquisition target profitability. Furthermore, coefficients on *NIP* and *NVIP* are both greater and more significant for the target 22-day (-20, +1) CAR (in models (1), (2), (3), and (4)) than those for the target 3-day (-1, +1) CAR (in models (5), (6), (7), and (8)), which is consistent with prior literature that there is information leakage on the upcoming deal before public announcement (Meulbroek 1992). These relations are also economically significant, with a one-standard deviation increase in *NIP* (*NVIP*) increasing the target 22-day (-20, +1) market-model CAR and the target 22-day four-factor model CAR by 1.91% (1.86%) and 1.90% (1.84), while a one-standard deviation increase in *NIP* (*NVIP*) raises the target 3-day (-1, +1) market-model CAR and the target 3-day four-factor model CAR by 1.46% (1.40%) and 1.43% (1.80%), respectively.

Overall, the results from Table 5 and Table 6 provide strong evidence that target firms with higher insider net purchase ratios experience a higher acquisition offer price over the target stock price and higher cumulative abnormal returns at the acquisition announcement. We interpret this

evidence as indicative that target insiders' net purchases before M&A are perceived by outsiders (including acquirers and other investors) as a positive signal for acquisition profitability and synergy, such that target firms with higher insider net purchase ratios are paid with higher takeover premiums.

IV.3. Payment Method of Acquisitions

To test whether target insider net purchase ratios are negatively (positively) related to the percentage of stock (cash) payment, we estimate the following OLS regression model (8-1) and logit model (8-2):

$$Pct\_STOCK = \beta_0 + \beta_1 NIP(or\ NVIP)_{i,(t-365day,t-1day)} + \sum\beta_j Acquirer\_Control_j$$
$$+ \sum\beta_i Target\_Control_i + \sum\beta_k Deal\_Control_k + \sum\gamma_t Year_t + \sum\tau_l Industry_l + \varepsilon \qquad (8\text{-}1)$$

$$Prob(CASH=1) = F\,[\beta_0 + \beta_1 NIP(or\ NVIP)_{i,(t-365day,t-1day)} + \sum\beta_j Acquirer\_Control_j$$
$$+ \sum\beta_i Target\_Control_i + \sum\beta_k Deal\_Control_k + \sum\gamma_t Year_t + \sum\tau_l Industry_l + \varepsilon] \qquad (8\text{-}2)$$

In model (8-1), the dependent variable, *Pct_STOCK*, indicates the percentage of stock payment out of total payment. To enhance the validity of the inference on payment method, we alternatively employ a binary choice (i.e., logit) model (8-2), where the dependent variable, *CASH*, is an indicator variable that equals 1 if more than 50% of the total payment is made by cash and 0 otherwise. Again, the variables of interest are the target firm's *NIP* or *NVIP*, and H3 predicts β_1 to be negative for model (8-1) and positive for model (8-2).

We control for variables which prior studies find to be associated with M&A payment method (e.g., Martin 1996; Dong et al. 2006; Raman et al. 2013). Again these control variables are classified into three sets of variables: (1) acquirer firm characteristics – size (*Acq_SIZE*), market-to book-ratio (*Acq_MTB*), return on assets (*Acq_ROA*), leverage (*Acq_LEV*), and free cash flows(*Acq_FCF*); (2) target firm characteristics – size (*Tgt_SIZE*), market-to-book ratio (*Tgt_MTB*), leverage (*Tgt_LEV*), returns on assets (*Tgt_ROA*), market return over the period of (-400,-40) days before the acquisition announcement date (*Tgt_RUN-UP*), institutional ownership (*Tgt_BLOCK*), and earning-to-price ratio

(*Tgt_EP*); and (3) deal characteristics – relative size (*REL_SIZE*), different industry dummy (*DIFFIND*), multiple bidders dummy (*MULBIDDER*), and tender offer indicator (*TENDER*). We also add premium offered for the target (*Prem1W*) as another control as well as year and industry fixed effects. All control variables are defined as in Appendix A. As before, industry and year fixed effects are included and standard errors are clustered within acquirer firm.

Regression results are displayed in Table 7. The OLS regression in which the percentage of total payment made by stock (*Pct_STOCK*) is the dependent variable is employed in models (1) and (2), while the logit regression where cash payment dummy (*CASH*) is the dependent variable is used in models (3) and (4). For models (1) and (2) that focus on the effect of target insider net purchase ratios on stock payment percentage, the coefficients on *NIP* and *NVIP* are both negative (-0.0372 on *NIP* and -0.0373 on *NVIP*) and statistically significant at the 1% level. Consistently, the results from models (3) and (4) that examine the effect of target insider net purchase ratios on cash payment dummy, the coefficients on *NIP* and *NVIP* are both positive (0.0258 on *NIP* and 0.0259 on *NVIP*) at the 1% significance level. Economically, a one-standard deviation increase in *NIP* (*NVIP*) reduces the percentage of stock payment by 2.24% (2.25%) while it increases cash payment likelihood by 15.53% (15.60%).

The evidence of the negative (positive) relation between the percentage of stock (cash) and target insider's net purchases ratios indicates that when target insiders net purchase ratios are higher, acquirers perceive them as less downside information risk, and thus tend to offer stock (cash) less (more) as the medium of takeover payment. Overall, the findings on payment medium suggest that target insider trades before M&A plays a role as a signal for the acquirer, which attenuates the information asymmetry between target insiders and acquirers, in particular, the acquirer's overpayment risk.

V. ROBUSTNESS CHECKS AND EXTENSION

V.1. Alternative Aggregation Periods for Target Insider Trading

In the US, corporate insiders are not allowed to trade on material, non-public information (Securities Exchange Act of 1934) prior to M&A, and the Short Swing rule (Section 16b) that requires registered corporate insiders to return to the company any profit on round-trip trades discourages target insiders from buying target stock within six months before merger completion.[16] Therefore, it can be argued that since insider trades made within this six-month period (i.e. -180 to -1 days) immediately before M&A announcements are more refrained by the Short Swing rule and thus are unlikely to reflect insiders' private knowledge, they could impair the representativeness of the sample for insider trading, introducing an issue of weak statistical power. If this is the case, the research design with insider trades made within this window could be a less appealing setting for testing the informativeness of insider trading about target firms' future potential. To address this, we divide the pre-M&A one-year period into the first six months (i.e. -365 days to -181 days) and the second six months (i.e. -180 to -1 days) before the deal announcement, and for each period we calculate net insider purchase ratios and replicate all previous regressions.

Table 8 displays the estimates of the variables of interest, *Com1_CAR2*, *Δ3yrAdjROA*, *Prem4W*, *Tgt_22dCAR2*, and *CASH*. The results for both sub-periods are generally similar to those for the one-year period. Panel A presents the results from the six-month period (i.e. -180 to -1 days) immediately before the M&A announcement that covers the period during which insider trades most severely discouraged period. Nonetheless, the results are generally similar to the main findings. Specifically, the coefficients on *NIP* and *NVIP* for *Com1_CAR2* (models (1) and (2)) are positive and significant at the 5% level while those for industry-adjusted ROA change (*Δ3yrAdjROA*) in models

---

[16] Target insiders are not certain during the negotiation or transaction period about when the merger will complete and the length of takeover talks appears to have substantial cross-sectional variation across involved firms.

(3) and (4) are positive but statistically insignificant, possibly due to the insufficient statistical power stemming from limited insider trades. The premium (*Prem4W*) acquirer pays (models (5) and (6)) is positively related to target insider net purchase measures (*NIP* and *NVIP*) at the 5% level. The target CAR at the M&A announcement (models (7) and (8)) is also positive although the statistical significance is weaker compared to that of the one-year window sample. The probability of cash payment (models (9) and (10)) is positively related to target insider net purchases, indicating that the acquirer tends to pay more by cash when pre-M&A target insider net purchase ratio is higher.

Panel B displays the results for the first six-month period (i.e. -365 to -181 days) of the one-year period before the M&A announcement that are generally similar to the main findings while those for *Com1_CAR2* are not significant. Specifically, the *NIP* and *NVIP* coefficients for the combined CAR in models (1) and (2) are positive although their statistical significance is less than 10%. For the industry adjusted ROA change (*Δ3yrAdjROA*), as seen in models (3) and (4), the coefficients on *NIP* and *NVIP* are 0.0120 and 0.0118 at the 1% significant level, which are greater than those from the primary tests (see Table 4) for the one-year period insider trades. As seen in next six columns, payment premium of takeover, target CARs at the M&A announcement, and the likelihood of cash payment are all positively and significantly related to target insider net purchases (*NIP* and *NVIP*).

V.2. Only with Target Insiders' Green Window Trading

Some may argue that firms with high inside purchases/sales are systematically different in insider trading policies from firms with low inside purchases/sales, which could lead to our finding. According to prior studies (e.g. Bettis, Coles, and Lemmon 2000), firms often restrict their insider trading to the period: two weeks to one month immediately following firms' quarterly earnings announcements (so-called "green window"). Since insider trades within the green window are commonly allowed for most firms, they are least likely to be affected by differing insider trading

policies across firms. To calculate the green-window net purchases volume (*NIP_GW*) and value ratios (*NVIP_GW*), we use the same approach described in section 3.1 to aggregate target insider trades occurred within the *one month* window following the target's quarterly earnings announcements occurred during the pre-M&A one-year period.[17] With these green-window insider purchase ratio measures, we replicate all previous regressions. If we obtain similar results from green-window insider trades that are made under more common insider trading policies across firms, it is less likely that our findings are driven by heterogeneous insider trading policies across firms.[18]

Results are reported in Table 9. Models (1) and (2) show that the coefficients on *NIP* and *NVIP* for the *Com1_CAR2* model are positive at nearly a significant level. The change in ROA is significantly and positively associated with green-window insider net purchase ratios. In the industry-adjusted ROA models (columns (3) and (4)), for example, the coefficients on *NIP* and *NVIP* are 0.0110 and 0.0106, respectively, at the 5% level, again supporting the main findings. The results on takeover premium and payment method reported in models (5) - (10) indicate that the signaling role of target insider trading is still supported although the significance levels are a bit weaker than the main results. In sum, the results from green window insider trades lend additional credence to the signaling hypothesis.

V.3. Instrumental Variables Approach

Thus far, we interpret our findings as indicative that target firms' insider trading signals synergy gains from potential acquisitions of the target. Some may argue that there could be omitted variables (e.g., the target firm's expected future performance that is estimated by acquirers' own analysis, other signals from the target's disclosures, etc.) that are correlated with target insider trading

---

[17] Because we restrict the trading window to 30 days, insider transactions used for regressions are much fewer than those without the restriction. This may weaken the statistical power of the regressions.

[18] Since the panel structure of our sample does not allow us to run firm fixed effects regressions, this alternative specification is particularly meaningful.

and M&A variables, causing so-called omitted correlated variable bias. For example, the observed association between insider trading activity and subsequent combined returns could be due to investors' interpretations of or reactions to unexpected events rather than insiders' trading. It can be also argued that, when target insiders wish to sell their stock to the acquirer at higher prices at the acquisition, they could opportunistically increase (decrease) the purchase (sale) of target stock in the year before the acquisition to make the target look more attractive to the potential bidders.[19] If this is the case, there is a potential reverse causality.

To address the potential endogeneity concern, we employ an instrumental variables approach. As an instrument, we use target insiders' net purchase ratios over the one-year period (-730 ~ -366 days) that precedes the aggregation window (-365 ~ -1 days) of the main tests. The target insider trading patterns during the former period (-730 ~ -366 days) are correlated with those of the latter period, while they are too stale to impact *directly* the acquirers' M&A decisions but affect only *indirectly* via target insider trading of the latter period (-365 ~ -1 days). We ensure that *NIP(or NVIP)$_{i,(t-730day,t-366day)}$* is significantly (*p*-value < 0.01) correlated with the *NIP(or NVIP)$_{i,(t-365day,t-1day)}$* but are not (*p*-value > 0.1) with the residuals of pre-instrumented regressions of the M&A profitability (*Com_CAR*), premiums (Payment premium or Target CAR) and payment decision (*Pct_STOCK*).[20] In the first stage, we estimate the instrumented (i.e., fitted) values of net purchase ratio (*Fitted_NIP* and *Fitted_NVIP*) using *NIP(or NVIP)$_{i,(t-730day,t-366day)}$* along with the control variables used in our main tests. Specifically, we estimate the following first-stage regression to obtain fitted values of net purchase ratios (*Fitted_NIP* and *Fitted_NVIP*):

---

[19] For example, if the target firm knows the acquirer uses target insider trading as an information source when evaluating the synergy potential of the acquisition, the target firm could strategically engage in insider trading to generate a high takeover premium even under the Short-Swing rule.

[20] Specifically, the exclusion criterion is not rejected (*p*-values are larger than 0.2) in all specifications except *F-statistics* against the null that this instrument is weak in the first-stage regression are at least 11.29 in all specifications, suggesting the instrument is not weak.

$$NIP(or\ NVIP)_{i,(t-365day,t-1day)} = \beta_0 + \beta_1 NIP(or\ NVIP)_{i,(t-730day,t-366day)} + \sum \beta_{jik}Control_{jik} + \varepsilon \qquad (9)$$

In the second stage, we replicate the previous regression models with the instrumented values obtained from equation (9). Table 10 provides the results from the second-stage regressions with adjusted standard errors. As shown in models (1) – (2), the instrumented net purchase ratios (*Fitted_NIP* and *Fitted_NVIP*) are positively associated with synergy gains from the acquisitions. Models (3) – (6) also show that the instrumented net purchase ratios positively associated with takeover premiums and target announcement returns at the 1% level. In addition, target insiders' net purchase ratios negatively affect the percentage of stock payment (models (7) and (8)). These results confirm the signaling effect of the target firm insiders' trading behavior on the synergy potential from the acquisition of the target.

V.4. Cross-Sectional Analysis: The Effect of Target Firm Information Environment

If the signaling effect of the target firm's insider trading is a main driver of our findings, the signaling effect of target insider trading on synergy gains of acquisitions, takeover premium, and cash payment likelihood will be greater when target firm information environment is poor. For example, the association between insider trading activity and subsequent (combined) returns is more likely due to the signaling of insiders' foreknowledge via insider trades when target firm is less transparent. To explore the validity of this inference, we conduct several cross-sectional analyses after dichotomizing target firms into subgroups based on their information environment. We discuss two of them in this section.

We first assess each target firm's information opacity level based on its size, i.e., the target firm's market value one year before the acquisition announcement (*Market value*). We then classify the baseline sample into two groups: (1) a subsample comprising target firms in the top half of the market value distribution (i.e. large market value target), which represents target firms with a low

level of information opacity and (2) the subsample with target firms in the bottom half of the market value distribution (i.e. small market value target) that constitutes target firms with a high level of information opacity. Alternatively, we assess a firm's information environment using bid-ask spreads (*BA_Spread*), which are calculated as the average daily bid-ask spreads for 200 days (i.e. -566 to -366 days) going backward from one year before the M&A announcement. Again we classify firms into two groups: (1) a subsample consisting of target firms in the bottom half of the *BA_Spread* distribution, which represents target firms facing a low degree of information asymmetry, and (2) the subsample with target firms in the top half of the *BA_Spread* distribution, which stands for target firms facing a high degree of information asymmetry.

Table 11 provides the regression results for each of the two subsamples. Consistent with our prediction, the results in Panel A reveal that the positive effects of the target firm's insider net purchase ratios on synergy gains of acquisitions (measured by *Com_CAR*) and takeover premiums (measured by *Prem4W* and *Target22d_CAR*) are more pronounced for smaller target firms and their differences are significant (p-value < 0.01). Also, the negative effect of target net purchase ratios on stock payment ratios is significantly (p-value < 0.05) larger for small than large target firms. Similarly, Panel B indicates that the positive effects of target firms' insider trading on synergy gains, takeover premium, and cash payment likelihood of acquisitions are stronger when their bid-ask spreads are high. Overall, the results from cross-sectional analyses in Table 11 support our argument that the target firm insider trading is a more informative signal to the acquirers when the target firm has more opaque information environment.

V.5. Abnormal Insider Trading

Some studies argue that opportunistic or abnormal insider trades are more informative than routine trades that are more likely to be regular in their timing and trades made for liquidity and

diversification reasons (e.g., Cohen et al. 2012). Therefore, opportunistic trades may better predict firms' future performance or forthcoming events, including post-M&A performance and M&A-related behaviors. We thus focus on opportunistic or abnormal insider trading and repeat the previous tests. Following Cohen et al. (2012), we define a routine trader as an insider who places a trade in the same calendar month for at least three consecutive years while we identify opportunistic traders as those who are not routine traders and for whom we cannot detect an obvious discernible pattern in timing of their trades. Using insider trades made by opportunistic traders only, we calculate opportunistic net insider purchase ratios (*NIP_Opp* and *NVIP_Opp*) for each acquisition deal. *NIP_Opp* and *NVIP_Opp* equal 0 when either no insider trades are made or only routine insider trades are made during the pre-M&A period.

Table 12 presents the results when we replicate previous tests using *NIP_Opp* and *NVIP_Opp* that are measured using target firm *i*'s aggregate insider purchases and sales within one year before the M&A announcement (i.e., -365 to -1). Models (1) – (2) indicate that the net purchase ratios (*NIP_Opp* and *NVIP_Opp*) of opportunistic insider trades are positively associated with synergy gains from the acquisitions, measured as *Com1_CAR2*. Models (3) – (6) show that net purchase ratios of opportunistic insider trades are positively associated with takeover premiums and target announcement returns at the 5 or 1% level. Finally, target insiders' opportunistic net purchase ratios negatively affect the percentage of stock payment (models (7) and (8)). These results are consistent with the signaling effect of the target firm insiders' abnormal trading behavior on the synergy potential from the acquisition of the target.

V.6. Additional Tests

Because we are interested in aggregate insider trades per acquisition to test the signaling hypothesis, the *net* purchase measure is more meaningful than separate measurements of purchases

and sales. Thus far, we therefore focused on the *net* purchase measure. However, prior work shows many target insiders refrain from buying shares ahead of M&A while some target insiders still buy shares. Further, sales can happen for a variety of reasons. To take into account the difference between increases (decreases) in purchases and decreases (increases) in sales, we separate purchases from sales, and repeat the regression analyses separately for the sample with purchases only and the sample with sales only. Although we do not tabulate, we summarize the results here. For the sample with purchases only, synergy gains, takeover premium, and cash payment likelihood are all positively associated with purchase ratios although the coefficient on the purchase ratios in the cash payment likelihood model is not significant. The sales-only sample shows that synergy gains, takeover premium, and cash payment likelihood are all positively associated with negative sales ratios (i.e., (-1)*sales ratios) while the coefficient on the negative sale ratios in the takeover premium regression is insignificant. These results suggest that the signaling role of target firm insiders' trading on the target's synergy potential stems from both increases in purchases and decreases in sales.

Thus far, we have focused on target insider trading rather than insider trading of acquirers because (1) target firm uncertainty is more of an issue in identifying synergy potential of M&A and (2) it is the acquirer who mainly searches for a target with a high synergy potential. If target insiders have private information about target firms' synergy potential, insiders of an acquiring firm may have some private information on the acquirer,s synergy potential that is unknown to the target. Further, if target insider trading plays the signaling role for synergy gains and if acquiring firm insiders learn a target's synergy potential from target insiders during the due diligence period, insider trades of acquirers may also signal synergy gains. We thus re-estimate equations (4) and (5) using acquiring firm insiders' *NIP* and *NVIP* instead of target insiders' *NIP* and *NVIP*. The untabulated results reveal that the acquirer and target's combined abnormal returns at the M&A announcement and operating

performance after acquisition are positively associated with acquiring firm insiders' pre-M&A net purchase ratios although the effect is insignificant or weaker than that of target firm insiders' pre-M&A net purchase ratios depending upon the model specifications.

VI. CONCLUSIONS

Our study extends the literature on the role and regulation of the insider trading by investigating whether target firm insider trading prior to mergers and acquisitions (M&A), which is subject to particularly stringent regulations under the Short Swing rule, affects takeover premium, payment method of acquisitions, and the synergy created by acquisitions. Our analysis reveals that target insiders' net purchase ratios before the M&A announcement are positively associated with synergies of an acquisition, the amount of takeover premium, and the percentage of cash payment of an acquisition. Further, the cross-sectional analysis indicates that those effects of target insider trading on M&A payment decisions and outcome are more pronounced when the targets' information environment is more asymmetric or less transparent. Taken together, these findings suggest that target firm insider trading is an important signal for synergy gains even though it is subject to severe regulations.

The implications of our findings are twofold. First, on the academic side, the effect of information asymmetry between the target and the acquirer in corporate mergers and acquisitions should be examined considering the role of the target insiders' trading behavior, because and the information reflected in target insiders' pre-M&A trades serves as a signal for acquisition synergy and the acquirer utilizes target insider trading as a public information source when evaluating the synergy effects of a potential target. Second, from a practical perspective, firms that plan to acquire other firms and desire to reduce adverse selection and overpayment risk might need to take into account target insiders' trading activities.

References

Agrawal, A., and J. F. Jaffe. 1995. Does Section 16b deter insider trading by target managers? Journal of Financial Economics 39(2-3): 295–319.

Agrawal, A., and T. Nasser. 2012. Insider trading in takeover targets. Journal of Corporate Finance 18(3): 598–625.

Ahern, K. R., and D. Sosyura. 2014. Who writes the news? Corporate press releases during merger negotiations. The Journal of Finance 69(1): 241–l291.

Ambrose, B. W., and W. L. Megginson. 1992. The role of asset structure, ownership structure, and takeover defenses in determining acquisition likelihood. Journal of Financial and Quantitative Analysis 27(4): 575–589.

Amel-Zadeh, A., and Y. Zhang. 2015. The economic consequences of financial restatements: Evidence from the market for corporate control. The Accounting Review 90(1):1–l29.

Andrade, G., M. Mitchell, and E. Stafford. 2001. New evidence and perspectives on mergers. Journal of Economic Perspectives 15(2): 103–l120.

Badertscher, B. A., S. P. Hribar, and N. T. Jenkins. 2011. Informed trading and the market reaction to accounting restatements. The Accounting Review 86(5): 1519–1547.

Bargeron, L., F. P. Schlingemann, R. M. Stulz, and C. J. Zutter. 2008. Why do private acquirers pay so little compared to public acquirers? Journal of Financial Economics 89(3): 375–390.

Barraclough, K., D. T. Robinson, T. Smith, and R. E. Whaley. 2013. Using option prices to infer overpayments and synergies in M&A transactions. The Review of Financial Studies 26(3): 695–722.

Betton, S., B. E. Eckbo, and K. Thorburn. 2008. Corporate takeovers, in B.E. Eckbo, ed.: Handbook of Empirical Corporate Finance: Empirical Corporate Finance, Vol. 2 (Elsevier/North-Holland Handbook of Finance Series).

Bhattacharya, U. 2014. Insider trading controversies: A literature review. Annual Review of Financial Economics 6: 385–l403.

Bauguess, S. W., S. B. Moeller, F. P. Schlingemann, and C. J. Zutter. 2009. Ownership structure and target returns. Journal of Corporate Finance 15(1): 48–l65.

Berger, P. G., and E. Ofek. 1996. Bustup takeovers of value-destroying diversified firms. The Journal of Finance 51: 1175–l1200.

Bettis, J. C., J. L. Coles, and M. L. Lemmon. 2000. Corporate policies restricting trading by insiders. Journal of Financial Economics 57(2): 191–220.

Bruner, R. F., 2004. Applied mergers & acquisitions. John Wiley and Sons, New York.

Cai, Y., Y. Kim, J. C. Park, and H. D. White. 2016. Common auditors in M&A transactions. Journal of Accounting and Economics 61(1): 77–l99.

Chen, C., X. Martin, and X. Wang. 2013. Insider trading, litigation concerns, and auditor going-concern opinions. The Accounting Review 88(2): 365–393.

Cheng, Q., and K. Lo. 2006. Insider trading and voluntary disclosures. Journal of Accounting Research 44(5): 815–l 848.

Cohen, L., C. Malloy, and L. Pomorski. 2012. Decoding inside information. The Journal of Finance 67(3): 1009–1043.

Copeland, T., T. Koller, and J. Murrin. 2000. Valuation: Measuring and managing the value of companies, 3rd ed.. John Wiley and Sons, New York.

Dong, M., D. Hirshleifer, S. Richardson, and S. H. Teoh. 2006. Does investor misvaluation drive the takeover market? The Journal of Finance 61(2): 725–762.

Eckbo, B. E., R. M. Giammarino, and R. L. Heinkel. 1990. Asymmetric information and the medium of exchange in takeovers: Theory and tests. The Review of Financial Studies 3(4): 651–675.

Erickson, M., S. Wang, and X. Zhang. 2012. The change in information uncertainty and acquirer wealth losses. Review of Accounting Studies 17(4): 913–943.

Finnerty, J. E. 1976. Insiders and market efficiency. The Journal of Finance 31(4): 1141–1148.

Fishman, M. J. 1989. Preemptive bidding and the role of the medium of exchange in acquisitions. The Journal of Finance 44(1): 41–57.

Goodman, T., M. Neamtiu, N. Shroff, and H. White. 2014. Management forecast quality and capital investment decisions. The Accounting Review 89(1): 331–365.

Gu, F., and J. Q. Li. 2007. The credibility of voluntary disclosure and insider stock transactions. Journal of Accounting Research 45(4): 771–810.

Hansen, R. G. 1987. A theory for the choice of exchange medium in mergers and acquisitions. The Journal of Business 60(1): 75–l95.

Harford, J. 2005. What drives merger waves? Journal of Financial Economics 77(3): 529–l560.

Harford, J., M. Humphery-Jenner, and R. Powell. 2012. The sources of value destruction in acquisitions by entrenched managers. Journal of Financial Economics 106(2): 247–l261.

Healy, P. M., K. G. Palepu, and R. S. Ruback. 1992. Does corporate performance improve after mergers? Journal of Financial Economics 31(2): 135–l175.

Heron, R., and E. Lie. 2002. Operating performance and the method of payment in takeovers. Journal of Financial and Quantitative Analysis 37(1): 137–l155.

Holmström, B., and S. N. Kaplan. 2001. Corporate governance and merger activity in the United States: Making sense of the 1980s and 1990s. Journal of Economic Perspectives 15(2): 121–l144.

Huddart, S., and B. Ke. 2007. Information asymmetry and cross-sectional variation in insider trading. Contemporary Accounting Research 24(1): 195–232.

Huddart, S., B. Ke, and C. Shi. 2007. Jeopardy, non-public information, and insider trading around SEC 10-K and 10-Q filings. Journal of Accounting and Economics 43(1): 3–l36.

Jensen, M. C., and R. S. Ruback. 1983. The market for corporate control: The scientific evidence. Journal of Financial Economics 11(1-4): 5–l50.

John, K., and L. Lang. 1991. Insider trading around dividend announcements: Theory and evidence. The Journal of Finance 46(4): 1361–1389.

Johnson, D. J., J. M. Serrano, and G. R. Thompson. 1996. Seasoned equity offerings for new investment and the information content of insider trades. Journal of Financial Research 19(1): 91–103.

Ke, B., S. Huddart, and K. Petroni. 2003. What insiders know about future earnings and how they use it: Evidence from insider trades. Journal of Accounting and Economics 35(3): 315–346.

Keown, A., and J. Pinkerton. 1981. Merger announcements and insider trading activity: An empirical investigation. The Journal of Finance 36(4): 855–869.

Lajoux, A., and C. Elson. 2000. The art of M&A due diligence. McGraw Hill, New York.

Lang, L., R. M. Stulz, and R. A. Walkling. 1991. A test of the free cash flow hypothesis: The case of bidder returns. Journal of Financial Economics 29(2): 315–l335.

Lakonishok, J., and I. Lee. 2001. Are insider trades informative? The Review of Financial Studies 14(1): 79–l111.

Malmendier, U., M. Opp, and F. Saidi. 2016. Target revaluation after failed takeover attempts: Cash versus stock. Journal of Financial Economics 119(1): 92–l106.

Martin, K. J. 1996. The method of payment in corporate acquisitions, investment opportunities, and management ownership. The Journal of Finance 51(4): 1227–l1246.

Martin, X., and R. Shalev. 2017. Target firm-specific information and acquisition efficiency. Management Science 63(3): 672–690.

McNichols, M., and S. Stubben. 2015. The effect of target-firm accounting quality on valuation in acquisitions. Review of Accounting Studies 20(1): 110–140.

Meulbroek, L. K. 1992. An empirical analysis of illegal insider trading. The Journal of Finance 47(5): 1661–1699.

Meulbroek, L. K., and C. Hart. 1997. The effect of illegal insider trading on takeover premia. European Finance Review 1(1): 51–80.

Moeller, S., F. Schlingemann, and R. Stulz. 2004. Firm size and the gains from acquisitions. Journal of Financial Economics 73(2): 201–228.

Moeller, S., F. Schlingemann, and R. Stulz. 2007. How do diversity of opinion and information asymmetry affect acquirer returns? Review of Financial Studies, 20(6): 2047–2078.

Morellec, E., and A. Zhdanov. 2005. The dynamics of mergers and acquisitions. Journal of Financial Economics 77(3): 649–672.

Ofek, E., and D. Yermack. 2000. Taking stock: Equity-based compensation and the evolution of managerial ownership. The Journal of Finance 55(3): 1367–1384.

Officer, M. S. 2007. The price of corporate liquidity: Acquisition discounts for unlisted targets. Journal of Financial Economics 83(3): 571–598.

Officer, M. S., A. B. Poulsen, and M. Stegemoller. 2009. Target-firm information asymmetry and acquirer returns. Review of Finance 13(3): 467–l493.

Palepu, K. 1986. Predicting takeover targets: A methodological and empirical analysis. Journal of Accounting and Economics 8(1): 3–l35.

Piotroski, J. D., and D. Roulstone. 2005. Do insider trades reflect both contrarian beliefs and superior knowledge about future cash flow realizations? Journal of Accounting and Economics 39(1): 55–l81.

Raman, K., L. Shivakumar, and A. Tamayo. 2013. Target's earnings quality and bidders' takeover decisions. Review of Accounting Studies 18(4): 1050–11087.

Rogers, J. L. 2008. Disclosure quality and management trading incentives. Journal of Accounting Research 46 (5): 1265–11296.

Ryan, S. G., J. W. Tucker, and Y. Zhou. 2016. Securitization and insider trading. The Accounting Review 91(2): 649–675.

Schwert, G. W. 2000. Hostility in takeovers: In the eyes of the beholder? The Journal of Finance 55(6): 2599–l2640.

Seyhun, H. N. 1986. Insiders' profits, cost of trading, and market efficiency. Journal of Financial Economics 16(2): 189–212.

Seyhun, H. N. 1992. Why does aggregate insider trading predict future stock returns? The Quarterly Journal of Economics 107(4): 1303–1331.

Seyhun, H. N. 1998. Investment intelligence from insider trading. MIT Press, Cambridge, MA.

Skaife, H. A., and D. D. Wangerin. 2013. Target financial reporting quality and M&A deals that go bust. Contemporary Accounting Research 30(2): 719–l749.

Veenman, D. 2012. Disclosures of insider purchases and the valuation implications of past earnings signals. The Accounting Review 87(1): 313–342.

Wang, C., and F. Xie. 2009. Corporate governance transfer and synergistic gains from mergers and acquisitions. The Review of Financial Studies 22(2): 829–858.

APPENDIX A. Variable Definition

Main Variables	
NIP	The number of shares purchased minus the number of shares sold during the 1 year (-365, -1) window up to the M&A announcement date, divided by the sum of the number of shares purchased and the number of shares sold during the same period.
NVIP	The value of shares purchased minus the value of shares sold during the 1 year (-365,-1) window up to the M&A announcement date, divided by the sum of the value of shares purchased and value of shares sold during the same period.
Prem4W	The ratio of excess offer price to target stock price 4 weeks prior to the M&A announcement date (Offer price – TargetClosingPrice4wk)/TargetClosingPrice4wk).
Prem1W	The ratio of excess offer price to target stock price 1 week prior to the M&A announcement date (Offer price – TargetClosingPrice1wk)/TargetClosingPrice1wk).
Prem1D	The ratio of excess offer price to target stock price 1 day prior to the M&A announcement date (Offer price – TargetClosingPrice1day)/TargetClosingPrice1day).
Tgt_22dCAR1	Target cumulative abnormal return measured over 22 days (-20, +1) around the acquisition announcement, in which the abnormal returns are obtained from a *market model* with the CRSP value-weighted index return as the market return. The parameters of the model are estimated over the period day -300 to day -60.
Tgt_22dCAR2	Target cumulative abnormal return measured over 22 days (-20, +1) around the acquisition announcement, in which the abnormal returns are obtained from a *four-factor model* with the CRSP value-weighted index return as the market return. The parameters of the model are estimated over the period day -300 to day -60.
Tgt_3dCAR1	Target cumulative abnormal return measured over 3 days (-1, +1) around the acquisition announcement, in which the abnormal returns are obtained from a *market model* with the CRSP value-weighted index return as the market return. The parameters of the model are estimated over the period day -300 to day -60.
Tgt_3dCAR2	Target cumulative abnormal return measured over 3 days (-1, +1) around the acquisition announcement, in which the abnormal returns are obtained from a *four-factor model* with the CRSP value-weighted index return as the market return. The parameters of the model are estimated over the period day -300 to day -60.
Pct_STOCK	Percentage of stock offered as payment medium by the bidding firm.
CASH	A dummy variable that equals 1 if more than 50 percent of acquisition payment is made by cash and 0 otherwise.
Com1_CAR1	Acquirer and target value-weighted average cumulative abnormal returns measured over 3 days (-1, +1) around the acquisition announcement for the acquirer and over 22 days (-20, +1) around the acquisition announcement for the target. The abnormal returns are obtained from a *market model* with the CRSP value-weighted index return as the market return. The parameters of the model are estimated over the period day -300 to day -60.
Com1_CAR2	Acquirer and target value-weighted average cumulative abnormal returns measured over 3 days (-1, +1) around the acquisition announcement for the acquirer and over 22 days (-20, +1) around the acquisition announcement for the target. The abnormal returns are obtained from a *four-factor model* with the CRSP value-weighted index return as the market return. The parameters of the model are estimated over the period day -300 to day -60.
Com2_CAR1	Acquirer and target value-weighted average cumulative abnormal returns measured over 3 days (-1, +1) around the acquisition announcement for the acquirer and over 3 days (-1, +1) around the acquisition announcement for the target. The abnormal returns are obtained from a *market model* with the CRSP value-weighted index return as the market return. The parameters of the model are estimated over the period day -300 to day -60.
Com2_CAR2	Acquirer and target value-weighted average cumulative abnormal returns measured over 3 days (-1, +1) around the acquisition announcement for the acquirer and over 3 days (-1, +1) around the acquisition announcement for the target. The abnormal returns are obtained from a

	four-factor model with the CRSP value-weighted index return as the market return. The parameters of the model are estimated over the period day -300 to day -60.
Δ3yrROA	The change in the three-year average of (combined entity's) ROA after the acquisition completion from the three-year average of (acquirer and target value-weighted) ROA before the acquisition announcement. ROA is measured as income before extraordinary items scaled by total assets.
Δ3yrAdjROA	The change in the three-year average of industry-adjusted (combined entity's) ROA after the acquisition completion from the three years' average of industry-adjusted (acquirer and target value-weighted) ROAs before the acquisition announcement. Industry-adjusted ROA is measured as firm's ROA minus the median ROA of firms with the same two-digit SIC code.

Control Variables	
Acq_SIZE	Acquirer size. Measured as the natural logarithm of acquirer's total assets at the fiscal year-end before the acquisition announcement.
Acq_MTB	Acquirer's pre-acquisition market to book ratio. Measured as the ratio of acquirer's market value of equity to the book value of equity at the fiscal year-end before the acquisition announcement.
Acq_ROA	Acquirer's return on assets for the year ended before the announcement year, measured as income before extraordinary items, scaled by total assets.
Acq_LEV	Acquirer's pre-acquisition leverage. Measured as the sum of long-term debt and short-term debt, deflated by total assets at the fiscal year-end before the acquisition announcement.
Acq_FCF	Acquirer's pre-acquisition free cash flow. Measured as operating income before depreciation minus interest expense minus income taxes minus capital expenditure, deflated by total assets at the fiscal year end before the acquisition announcement.
Tgt_SIZE	Target size. Measured as the natural logarithm of target's total assets at the fiscal year-end before the acquisition announcement.
Tgt_MTB	Target's pre-acquisition market to book ratio. Measured as the ratio of target's market value of equity to the book value of equity at the fiscal year-end before the acquisition announcement.
Tgt_ROA	Target's return on assets for the year ended before the announcement year, measured as income before extraordinary items, scaled by total assets.
Tgt_LEV	Target's pre-acquisition leverage. Measured as the sum of long-term debt and short-term debt, deflated by total assets at the fiscal year- end before the acquisition announcement.
Tgt_EP	Target's earnings to price ratio at the fiscal year-end before the acquisition announcement.
Tgt_TANG	Target's ratio of net property, plant and equipment over total assets at the fiscal year-end before the acquisition announcement.
Tgt_LIQ	Target's ratio of net liquid assets (total current assets – current liabilities) to total assets at the fiscal year-end before the acquisition announcement.
Tgt_SGROW	Target's sales growth ratio. Measured as the natural logarithm of target's total sales at the fiscal year-end before the acquisition announcement over the previous year's total sales.
Tgt_BLOCK	The ratio of target shares held by institutional investors.
Tgt_RUN-UP	Target's market returns over the period of (-400,-40) days before the acquisition announcement.
TENDER	A dummy variable that takes the value of 1 if the deal is classified as a tender offer by SDC and 0 otherwise.
DIFFIND	A dummy variable that equals 1 if the acquirer and the target have different two-digit SIC codes and 0 otherwise.
REL_SIZE	Relative deal size. Measured as the ratio of the transaction value to the market value of the bidder 60 days before the acquisition announcement.
MULBIDDER	A dummy variable that equals 1 if the number of bidders reported by SDC is more than one and 0 otherwise.
VWROA	Acquirer and target's market value-weighted average ROA during the last fiscal year before the acquisition announcement.

TABLE1. Sample composition

Panel A: Sample Construction

Total US domestic M&A deals from SDC (1987-2016)		**77,388**
Less:		
Non-public acquirers or targets	69,375	
Deals that are restructures, recapitalizations, exchange offers, remaining interests acquisitions, certain assets acquisitions, spin-offs, split-offs, repurchases, privatizations, reverse-takeovers, or hostile takeovers.	1,049	
Bidders owning more than 20% of target shares before the acquisition or seeking to achieve less than 50% stake or missing values for percentage seeking	208	
Acquisitions with a deal value less than $1 million	59	
Acquisitions that are less than 1% of the acquirer's pre-acquisition market value	404	
Acquisitions with target firms that have not reported any insider trading activity over the whole sample period	980	
Final Mergers and Acquisition Sample		**5,313**

Panel B: Sample distribution by M&A announcement year

Announcement Year	Number of Observations	% of Sample
1987	123	2.32%
1988	126	2.37%
1989	132	2.48%
1990	77	1.45%
1991	108	2.03%
1992	117	2.20%
1993	168	3.16%
1994	245	4.61%
1995	267	5.03%
1996	302	5.68%
1997	393	7.40%
1998	385	7.25%
1999	392	7.38%
2000	341	6.42%
2001	246	4.63%
2002	152	2.86%
2003	165	3.11%
2004	179	3.37%
2005	151	2.84%
2006	165	3.11%
2007	174	3.27%
2008	102	1.92%
2009	92	1.73%
2010	104	1.96%
2011	65	1.22%
2012	94	1.77%
2013	94	1.77%
2014	116	2.18%
2015	129	2.43%
2016	109	2.05%
Total	**5,313**	**100.00%**

Panel A illustrates the sample construction. The sample consists of 5,313 U.S M&A announced between 1987 and 2016 in which more than 50% of publicly traded targets were acquired. Panel B shows sample distribution by announcement year.

TABLE 2. Descriptive statistics and correlations

Panel A: Descriptive statistics

Variable	N	Mean	Median	Std. Dev.
Main Variables				
NIP	5313	-0.0073	0.0000	0.6021
NVIP	5313	-0.0092	0.0000	0.6022
Com1_CAR1	3941	0.0235	0.0143	0.0737
Com1_CAR2	3941	0.0231	0.0136	0.0735
Com2_CAR1	3958	0.0167	0.0099	0.0675
Com2_CAR2	3958	0.0162	0.0093	0.0677
Δ3yrROA	2055	-0.0141	-0.0026	0.0757
Δ3yrAdjROA	2055	-0.0081	-0.0009	0.0748
Prem4W	4565	0.4384	0.3532	0.4299
Prem1W	4572	0.3903	0.3181	0.3916
Prem1D	4573	0.3451	0.2743	0.3623
Tgt_22dCAR1	4398	0.2643	0.2225	0.2629
Tgt_22dCAR2	4398	0.2614	0.2209	0.2630
Tgt_3dCAR1	4416	0.2074	0.1680	0.2233
Tgt_3dCAR2	4416	0.2066	0.1654	0.2222
Pct_STOCK	5313	0.5484	0.6578	0.4484
CASH	5313	0.3403	0.0000	0.4739
Acquirer Characteristics				
Acq_SIZE	4727	7.3901	7.4715	2.1623
Acq_MTB	4720	3.2010	2.1058	3.7760
Acq_LEV	4680	0.2122	0.1765	0.1816
Acq_FCF	3041	0.0061	0.0378	0.1488
Acq_ROA	4721	0.0115	0.0211	0.1370
Target Characteristics				
Tgt_SIZE	4232	5.6908	5.6352	1.8802
Tgt_MTB	4217	2.6043	1.7130	3.4285
Tgt_LEV	4201	0.2091	0.1522	0.2083
Tgt_ROA	4231	-0.0303	0.0123	0.1995
Tgt_SGROW	4119	0.1485	0.0984	0.3308
Tgt_EP	4228	-0.0652	0.0424	0.3827
Tgt_TANG	4129	0.2007	0.1028	0.2315
Tgt_LIQ	2977	0.2809	0.2570	0.2568
Tgt_BLOCK	5313	0.2543	0.1321	0.2985
Tgt_RUN-UP	4025	0.1265	0.0732	0.5629
Deal Characteristics				
TENDER	5313	0.1278	0.0000	0.3339
MULBIDDER	5313	0.0570	0.0000	0.2319
REL_SIZE	4926	0.4167	0.2175	0.5512
DIFFIND	5313	0.3115	0.0000	0.4631

Panel B: Correlation coefficients among key variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) *NIP*		0.99a	0.07a	0.06a	0.05b	0.05b	0.03	0.05b	0.09a	0.10a	0.08a	0.12a	0.11a	0.08a	0.08a	-0.05b	0.03c
(2) *NVIP*	0.99a		0.07a	0.07a	0.05b	0.05b	0.03	0.05b	0.08a	0.10a	0.08a	0.11a	0.11a	0.08a	0.08a	-0.06a	0.03c
(3) *Com1_CAR1*	0.08a	0.08a		0.96a	0.90a	0.87a	-0.06b	-0.04	0.19a	0.12a	0.12a	0.37a	0.35a	0.27a	0.27a	-0.21a	0.19a
(4) *Com1_CAR2*	0.08a	0.08a	0.97a		0.97a	0.90a	-0.06b	-0.03	0.17a	0.12a	0.12a	0.34a	0.36a	0.26a	0.26a	-0.21a	0.19a
(5) *Com2_CAR1*	0.08a	0.08a	0.90a	0.89a		0.97a	-0.06b	-0.04	0.11a	0.14a	0.16a	0.26a	0.24a	0.35a	0.35a	-0.24a	0.23a
(6) *Com2_CAR2*	0.08a	0.08a	0.88a	0.90a	0.98a		-0.07b	-0.03	0.09a	0.13a	0.16a	0.24a	0.25a	0.34a	0.34a	-0.24a	0.23a
(7) *Δ3yrROA*	0.07a	0.07a	-0.05c	-0.04	-0.05c	-0.05c		0.73a	0.01	0.01	0.01	-0.01	0.01	0.00	0.00	-0.04c	0.02
(8) *Δ3yrAdjROA*	0.09a	0.09a	-0.04	-0.04	-0.05c	-0.04	0.83a		-0.00	0.01	0.01	-0.03	-0.02	-0.02	-0.02	0.02	-0.03
(9) *Prem4W*	0.11a	0.11a	0.20a	0.18a	0.11a	0.10a	0.00	0.02		0.81a	0.74a	0.70a	0.68a	0.51a	0.51a	-0.09a	0.10a
(10) *Prem1W*	0.12a	0.12a	0.12a	0.11a	0.14a	0.13a	0.00	0.03	0.84a		0.90a	0.57a	0.57a	0.64a	0.64a	-0.10a	0.11a
(11) *Prem1D*	0.11a	0.10a	0.10a	0.10a	0.15a	0.14a	0.00	0.02	0.78a	0.93a		0.51a	0.51a	0.66a	0.66a	-0.10a	0.12a
(12) *Tgt_22dCAR1*	0.15a	0.14a	0.35a	0.36a	0.26a	0.25a	-0.02	-0.02	0.72a	0.59a	0.55a		0.96a	0.74a	0.73a	-0.21a	0.23a
(13) *Tgt_22dCAR2*	0.14a	0.14a	0.35a	0.37a	0.25a	0.25a	-0.01	-0.01	0.70a	0.59a	0.55a	0.97a		0.74a	0.74a	-0.22a	0.23a
(14) *Tgt_3dCAR1*	0.11a	0.11a	0.28a	0.27a	0.37a	0.36a	-0.01	-0.01	0.55a	0.64a	0.68a	0.79a	0.79a		0.99a	-0.25a	0.26a
(15) *Tgt_3dCAR2*	0.12a	0.11a	0.28a	0.27a	0.37a	0.36a	-0.01	-0.01	0.54a	0.64a	0.67a	0.78a	0.79a	0.99a		-0.25a	0.26a
(16) *Pct_STOCK*	-0.05b	-0.06b	-0.20a	-0.20a	-0.24a	-0.23a	-0.02	0.03	-0.07a	-0.08a	-0.07a	-0.21a	-0.22a	-0.24a	-0.24a		-0.83a
(17) *CASH*	0.04b	0.04b	0.19a	0.19a	0.23a	0.23a	-0.00	-0.06b	0.08a	0.08a	0.09a	0.21a	0.22a	0.25a	0.25a	-0.84a	

Panel A reports descriptive statistics for the variables used in this study. All variables are defined as in Appendix A. Values in parentheses are negative. All continuous variables are winsorized at the 1% and 99% levels. Panel B reports the Pearson (Spearman) correlation coefficients in the lower (upper) triangle among key variables. Superscripts a, b, and c represent the significance at the 0.01, 0.05, and 0.10 (two-sided) significance levels, respectively.

TABLE 3. Effect of target insider net purchases on combined cumulative abnormal returns at the acquisition announcement

	Com1_CAR1		Com1_CAR2		Com2_CAR1		Com2_CAR2	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
NIP	0.0056[b]		0.0054[b]		0.0062[b]		0.0062[b]	
	(2.094)		(2.049)		(2.488)		(2.430)	
NVIP		0.0058[b]		0.0056[b]		0.0064[b]		0.0064[b]
		(2.183)		(2.141)		(2.566)		(2.513)
Acq_SIZE	-0.0067[a]	-0.0067[a]	-0.0066[a]	-0.0066[a]	-0.0059[a]	-0.0059[a]	-0.0058[a]	-0.0058[a]
	(-4.299)	(-4.295)	(-4.276)	(-4.272)	(-4.006)	(-4.001)	(-3.944)	(-3.940)
Acq_MTB	-0.0011[b]	-0.0011[b]	-0.0009[c]	-0.0009[c]	-0.0006	-0.0006	-0.0006	-0.0006
	(-2.106)	(-2.104)	(-1.747)	(-1.746)	(-1.171)	(-1.170)	(-1.090)	(-1.088)
Acq_LEV	0.0346[a]	0.0345[a]	0.0327[a]	0.0327[a]	0.0347[a]	0.0346[a]	0.0349[a]	0.0348[a]
	(2.968)	(2.967)	(2.817)	(2.816)	(3.350)	(3.349)	(3.328)	(3.327)
Acq_FCF	-0.0098	-0.0098	0.0116	0.0116	-0.0202	-0.0201	-0.0081	-0.0081
	(-0.367)	(-0.366)	(0.440)	(0.441)	(-0.833)	(-0.832)	(-0.336)	(-0.334)
Acq_ROA	0.0239	0.0239	-0.0054	-0.0055	0.0143	0.0143	-0.0030	-0.0030
	(0.939)	(0.938)	(-0.222)	(-0.223)	(0.627)	(0.626)	(-0.134)	(-0.135)
Tgt_ROA	0.0015	0.0016	0.0031	0.0032	0.0045	0.0046	0.0066	0.0067
	(0.134)	(0.142)	(0.291)	(0.298)	(0.419)	(0.426)	(0.619)	(0.625)
Tgt_SIZE	0.0029	0.0029	0.0028	0.0028	0.0030[c]	0.0030[c]	0.0028[c]	0.0028[c]
	(1.611)	(1.613)	(1.585)	(1.588)	(1.788)	(1.790)	(1.672)	(1.674)
Tgt_BLOCK	0.0034	0.0035	0.0029	0.0030	0.0068	0.0069	0.0070	0.0070
	(0.447)	(0.453)	(0.384)	(0.391)	(0.952)	(0.958)	(0.978)	(0.984)
Tgt_MTB	-0.0013[a]	-0.0013[a]	-0.0011[b]	-0.0011[b]	-0.0011[b]	-0.0011[b]	-0.0011[b]	-0.0011[b]
	(-2.614)	(-2.606)	(-2.271)	(-2.264)	(-2.432)	(-2.426)	(-2.351)	(-2.344)
Tgt_LEV	-0.0050	-0.0051	-0.0040	-0.0040	-0.0073	-0.0074	-0.0082	-0.0083
	(-0.506)	(-0.512)	(-0.404)	(-0.410)	(-0.792)	(-0.797)	(-0.886)	(-0.891)
Tgt_RUN-UP	-0.0072[b]	-0.0072[b]	-0.0070[b]	-0.0070[b]	0.0012	0.0012	0.0015	0.0015
	(-2.214)	(-2.217)	(-2.231)	(-2.233)	(0.413)	(0.408)	(0.529)	(0.525)
TENDER	0.0158[a]	0.0158[a]	0.0143[a]	0.0143[a]	0.0122[a]	0.0122[a]	0.0111[a]	0.0111[a]
	(3.704)	(3.706)	(3.415)	(3.417)	(3.018)	(3.020)	(2.744)	(2.747)
MULBIDDER	-0.0066	-0.0066	-0.0067	-0.0067	-0.0116[b]	-0.0117[b]	-0.0125[b]	-0.0125[b]
	(-1.055)	(-1.056)	(-1.076)	(-1.077)	(-1.971)	(-1.972)	(-2.133)	(-2.134)
REL_SIZE	0.0354[a]	0.0354[a]	0.0362[a]	0.0362[a]	0.0227[a]	0.0227[a]	0.0223[a]	0.0223[a]
	(6.791)	(6.792)	(7.275)	(7.277)	(4.965)	(4.967)	(4.911)	(4.913)

DIFFIND	-0.0020	-0.0020	-0.0013	-0.0013	-0.0031	-0.0031	-0.0026	-0.0026
	(-0.574)	(-0.570)	(-0.389)	(-0.384)	(-0.945)	(-0.940)	(-0.788)	(-0.784)
Pct_STOCK	-0.0263ᵃ	-0.0263ᵃ	-0.0282ᵃ	-0.0281ᵃ	-0.0293ᵃ	-0.0293ᵃ	-0.0306ᵃ	-0.0305ᵃ
	(-6.081)	(-6.074)	(-6.441)	(-6.433)	(-7.091)	(-7.084)	(-7.287)	(-7.280)
Constant	0.0156	0.0154	0.0232	0.0229	0.0111	0.0109	0.0135	0.0133
	(0.869)	(0.856)	(1.328)	(1.314)	(0.680)	(0.670)	(0.830)	(0.819)
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,248	2,248	2,248	2,248	2,246	2,246	2,246	2,246
Adj. R²	0.190	0.190	0.194	0.194	0.152	0.152	0.151	0.151

This table presents the results from the regression of acquirer-target combined announcement cumulative abnormal returns (*Com1_CAR1, Com1_CAR2, Com2_CAR1,* or *Com2_CAR2*) on target insider net purchase ratios (*NIP* or *NVIP*). The variables are defined in Appendix A. *Industry Fixed* denotes acquirer industry fixed effects. Standard errors are clustered within the acquirer firm. T-statistics are in parentheses. Superscripts a, b, and c indicate the significance of parameter estimates at the 1, 5, and 10 % (two-sided) significance levels, respectively.

TABLE 4. Effect of target insider net purchases on post-acquisition accounting performance

	Δ3yrAdjROA (1)	Δ3yrAdjROA (2)	Δ3yrROA (3)	Δ3yrROA (4)
NIP	0.0086^b		0.0075^b	
	(2.256)		(2.036)	
NVIP		0.0085^b		0.0073^b
		(2.216)		(1.980)
Acq_SIZE	0.0016	0.0016	0.0027	0.0027
	(0.634)	(0.633)	(1.051)	(1.050)
Acq_MTB	0.0002	0.0002	-0.0012	-0.0012
	(0.168)	(0.165)	(-1.192)	(-1.195)
Acq_LEV	0.0086	0.0086	0.0188	0.0188
	(0.496)	(0.493)	(1.012)	(1.010)
Acq_FCF	0.0740	0.0740	0.1210^c	0.1210^c
	(1.537)	(1.537)	(1.942)	(1.942)
Tgt_SIZE	-0.0021	-0.0021	-0.0035	-0.0035
	(-0.823)	(-0.825)	(-1.411)	(-1.413)
Tgt_BLOCK	0.0045	0.0045	0.0067	0.0068
	(0.418)	(0.421)	(0.621)	(0.623)
Tgt_MTB	0.0002	0.0002	0.0004	0.0004
	(0.231)	(0.231)	(0.446)	(0.443)
Tgt_LEV	0.0086	0.0087	0.0113	0.0114
	(0.590)	(0.595)	(0.794)	(0.798)
Tgt_RUN-UP	-0.0064	-0.0065	-0.0106	-0.0107^c
	(-1.015)	(-1.021)	(-1.644)	(-1.650)
VWROA	-0.2350^a	-0.2350^a	-0.2740^a	-0.2740^a
	(-4.846)	(-4.844)	(-5.074)	(-5.072)
TENDER	-0.0006	-0.0006	-0.0073	-0.0073
	(-0.087)	(-0.089)	(-1.153)	(-1.156)
MULBIDDER	0.0036	0.0036	0.0142^b	0.0142^b
	(0.508)	(0.512)	(2.208)	(2.210)
REL_SIZE	-0.0091	-0.0091	-0.0095	-0.0095
	(-1.441)	(-1.440)	(-1.452)	(-1.451)
DIFFIND	-0.0095^c	-0.0094^c	-0.0089	-0.0089
	(-1.842)	(-1.840)	(-1.587)	(-1.586)
Pct_STOCK	0.0019	0.0018	-0.0043	-0.0044
	(0.289)	(0.285)	(-0.685)	(-0.690)
Constant	0.0056	0.0057	-0.0748^b	-0.0747^b
	(0.325)	(0.329)	(-1.997)	(-1.994)
Year Fixed	Yes	Yes	Yes	Yes
Industry Fixed	No	No	Yes	Yes
N	1,344	1,344	1,344	1,344
Adj. R²	0.058	0.058	0.125	0.125

This table presents the results from the regression of the change in accounting performance around acquisitions (Δ3yrROA or Δ3yrAdjROA) on target insider net purchase ratios (*NIP* or *NVIP*). The variables are defined in Appendix A. *Industry Fixed* denotes acquirer industry fixed effects. Standard errors are clustered within the acquirer firm. T-statistics are in parentheses. Superscripts a, b, and c indicate the significance of parameter estimates at the 1, 5, and 10 % (two-sided) significance levels, respectively.

TABLE 5. Effect of target insider net purchases on the premium of offer price

	Prem4W		Prem1W		Prem1D	
	(1)	(2)	(3)	(4)	(5)	(6)
NIP	0.0472^a		0.0510^a		0.0441^a	
	(3.246)		(3.952)		(3.513)	
NVIP		0.0449^a		0.0483^a		0.0417^a
		(3.080)		(3.729)		(3.315)
Acq_SIZE	0.0569^a	0.0569^a	0.0409^a	0.0409^a	0.0332^a	0.0332^a
	(6.303)	(6.305)	(4.911)	(4.910)	(4.151)	(4.150)
Acq_MTB	0.0051^b	0.0051^b	0.0038^c	0.0038^c	0.0027	0.0027
	(2.120)	(2.121)	(1.758)	(1.757)	(1.356)	(1.356)
Acq_LEV	-0.0312	-0.0314	-0.0355	-0.0357	-0.0443	-0.0445
	(-0.473)	(-0.476)	(-0.571)	(-0.576)	(-0.783)	(-0.787)
Acq_FCF	-0.0882	-0.0871	-0.127	-0.126	-0.0865	-0.0855
	(-0.540)	(-0.532)	(-0.852)	(-0.844)	(-0.641)	(-0.633)
Acq_ROA	0.1220	0.121	0.0541	0.0531	-0.0528	-0.0536
	(0.786)	(0.780)	(0.410)	(0.402)	(-0.454)	(-0.461)
Tgt_ROA	0.0186	0.0181	-0.0022	-0.0028	0.0136	0.0131
	(0.189)	(0.184)	(-0.026)	(-0.032)	(0.165)	(0.160)
Tgt_SIZE	-0.0685^a	-0.0686^a	-0.0404^a	-0.0406^a	-0.0365^a	-0.0367^a
	(-6.373)	(-6.382)	(-4.161)	(-4.175)	(-3.932)	(-3.945)
Tgt_BLOCK	0.0647	-0.0649	-0.0452	-0.0453	-0.0426	-0.0428
	(-1.610)	(-1.615)	(-1.269)	(-1.274)	(-1.257)	(-1.261)
Tgt_MTB	-0.0060^b	-0.0060^b	-0.0069^a	-0.0069^a	-0.0057^a	-0.0057^a
	(-2.461)	(-2.471)	(-3.128)	(-3.140)	(-2.601)	(-2.612)
Tgt_LEV	0.0867	0.0872	0.0795	0.0801	0.0490	0.0495
	(1.413)	(1.421)	(1.458)	(1.468)	(0.926)	(0.936)
Tgt_RUN-UP	-0.0619^a	-0.0623^a	-0.0531^a	-0.0535^a	-0.0396^a	-0.0399^a
	(-3.511)	(-3.527)	(-3.448)	(-3.466)	(-2.866)	(-2.884)
Tgt_SGROW	0.0430	-0.0432	-0.0402	-0.0404	-0.0492^c	-0.0494^c
	(-1.257)	(-1.263)	(-1.341)	(-1.350)	(-1.754)	(-1.763)
Tgt_EP	-0.0803	-0.0802	-0.0592	-0.0591	-0.0361	-0.0359
	(-1.389)	(-1.387)	(-1.125)	(-1.122)	(-0.725)	(-0.723)
Tgt_TANG	0.0418	-0.0417	-0.0478	-0.0477	-0.0333	-0.0332
	(-0.644)	(-0.642)	(-0.832)	(-0.829)	(-0.601)	(-0.599)
Tgt_LIQ	0.0692	0.0688	0.0792	0.0787	0.0603	0.0599
	(1.207)	(1.199)	(1.472)	(1.461)	(1.171)	(1.161)
TENDER	0.0752^a	0.0753^a	0.0403^c	0.0404^c	0.0386^c	0.0387^c
	(3.132)	(3.132)	(1.729)	(1.732)	(1.757)	(1.759)
MULBIDDER	0.1880^a	0.1881^a	0.1490^a	0.1490^a	0.1420^a	0.1421^a
	(4.649)	(4.652)	(4.097)	(4.100)	(4.099)	(4.101)
REL_SIZE	0.0894^a	0.0895^a	0.0552^a	0.0553^a	0.0457^b	0.0458^b
	(4.099)	(4.102)	(2.745)	(2.749)	(2.425)	(2.428)
DIFFIND	0.0054	0.0055	0.0012	0.00126	-0.0067	-0.0066
	(0.271)	(0.273)	(0.068)	(0.069)	(-0.383)	(-0.382)
Pct_STOCK	0.0047	0.0045	-0.0232	-0.0234	-0.0082	-0.0084
	(0.179)	(0.171)	(-0.946)	(-0.954)	(-0.358)	(-0.366)
Constant	0.2160^b	0.2170^b	0.2830^a	0.2840^a	0.4060^a	0.4070^a
	(2.500)	(2.512)	(3.506)	(3.519)	(4.499)	(4.512)
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes	Yes	Yes
N	2,045	2,045	2,050	2,050	2,050	2,050
Adj. R^2	0.102	0.101	0.083	0.083	0.072	0.072

This table presents the results from the regression of the premium of offer price over the target firm's stock price (*Prem4W, Prem1W, or Prem1D*) on target insider net purchase ratios (*NIP* or *NVIP*). The variables are defined in Appendix A. *Industry Fixed* denotes acquirer industry fixed effects. Standard errors are clustered within the acquirer firm. T-statistics are in parentheses. Superscripts a, b, and c indicate the significance of parameter estimates at the 1, 5, and 10 % (two-sided) significance levels, respectively.

TABLE 6. Effect of target insider net purchases on the target's cumulative abnormal returns at the acquisition announcement

	Tgt_22dCAR1 (1)	Tgt_22dCAR1 (2)	Tgt_22dCAR2 (3)	Tgt_22dCAR2 (4)	Tgt_3dCAR1 (5)	Tgt_3dCAR1 (6)	Tgt_3dCAR2 (7)	Tgt_3dCAR2 (8)
NIP	0.0318[a]		0.0315[a]		0.0243[a]		0.0239[a]	
	(3.594)		(3.527)		(3.100)		(3.072)	
NVIP		0.0309[a]		0.0305[a]		0.0233[a]		0.0229[a]
		(3.499)		(3.410)		(2.974)		(2.946)
Acq_SIZE	0.0352[a]	0.0352[a]	0.0331[a]	0.0331[a]	0.0193[a]	0.0194[a]	0.0189[a]	0.0189[a]
	(6.280)	(6.282)	(5.835)	(5.836)	(4.032)	(4.034)	(3.958)	(3.959)
Acq_MTB	0.0026[c]	0.0026[c]	0.0026[c]	0.0026[c]	0.0016	0.0016	0.0016	0.0016
	(1.744)	(1.746)	(1.772)	(1.774)	(1.326)	(1.328)	(1.368)	(1.370)
Acq_LEV	-0.0341	-0.0343	-0.0336	-0.0338	-0.0282	-0.0284	-0.0231	-0.0233
	(-0.928)	(-0.934)	(-0.893)	(-0.899)	(-0.872)	(-0.878)	(-0.718)	(-0.724)
Acq_FCF	-0.0156	-0.0149	0.0258	0.0265	-0.0376	-0.0371	-0.0187	-0.0181
	(-0.178)	(-0.170)	(0.294)	(0.302)	(-0.533)	(-0.525)	(-0.265)	(-0.257)
Acq_ROA	0.1077	0.1071	0.0773	0.0767	0.0782	0.0777	0.0559	0.0554
	(1.302)	(1.293)	(0.947)	(0.938)	(1.203)	(1.195)	(0.859)	(0.852)
Tgt_ROA	0.0020	0.0020	0.0162	0.0162	0.0017	0.0016	0.0069	0.0068
	(0.037)	(0.037)	(0.300)	(0.299)	(0.037)	(0.035)	(0.150)	(0.148)
Tgt_SIZE	-0.0402[a]	-0.0403[a]	-0.0403[a]	-0.0404[a]	-0.0226[a]	-0.0227[a]	-0.0223[a]	-0.0223[a]
	(-5.904)	(-5.912)	(-5.728)	(-5.735)	(-4.004)	(-4.015)	(-3.979)	(-3.990)
Tgt_BLOCK	-0.0316	-0.0316	-0.0335	-0.0335	-0.0267	-0.0268	-0.0305	-0.0306
	(-1.292)	(-1.294)	(-1.357)	(-1.360)	(-1.277)	(-1.281)	(-1.469)	(-1.472)
Tgt_MTB	-0.0060[a]	-0.0060[a]	-0.0047[a]	-0.0048[a]	-0.0047[a]	-0.0047[a]	-0.0046[a]	-0.0046[a]
	(-3.876)	(-3.882)	(-3.016)	(-3.023)	(-3.466)	(-3.472)	(-3.465)	(-3.471)
Tgt_LEV	0.0650[c]	0.0652[c]	0.0771[b]	0.0774[b]	0.0286	0.0289	0.0294	0.0297
	(1.703)	(1.709)	(2.003)	(2.010)	(0.889)	(0.897)	(0.919)	(0.927)
Tgt_RUN-UP	-0.1102[a]	-0.1107[a]	-0.1085[a]	-0.1086[a]	-0.0458[a]	-0.0460[a]	-0.0458[a]	-0.0460[a]
	(-10.385)	(-10.393)	(-10.383)	(-10.390)	(-5.390)	(-5.402)	(-5.438)	(-5.449)
Tgt_SGROW	-0.0395[c]	-0.0395[c]	-0.0496[b]	-0.0497[b]	-0.0232	-0.0233	-0.0261	-0.0262
	(-1.894)	(-1.895)	(-2.386)	(-2.389)	(-1.371)	(-1.376)	(-1.551)	(-1.555)
Tgt_EP	-0.0315	-0.0315	-0.0281	-0.0281	0.0048	0.0048	0.0055	0.0055
	(-1.076)	(-1.075)	(-0.958)	(-0.956)	(0.183)	(0.184)	(0.214)	(0.215)

Tgt_TANG	0.0443	0.0444	0.0442	0.0442	0.0606^c	0.0607^c	0.0578^c	0.0579^c
	(1.114)	(1.115)	(1.110)	(1.111)	(1.803)	(1.804)	(1.729)	(1.729)
Tgt_LIQ	0.0915^a	0.0915^a	0.103^a	0.103^a	0.0819^a	0.0818^a	0.0819^a	0.0818^a
	(2.620)	(2.616)	(2.864)	(2.860)	(2.829)	(2.822)	(2.849)	(2.842)
TENDER	0.0939^a	0.0940^a	0.0925^a	0.0926^a	0.0758^a	0.0759^a	0.0747^a	0.0747^a
	(5.851)	(5.853)	(5.650)	(5.652)	(5.203)	(5.204)	(5.151)	(5.153)
MULBIDDER	-0.0318	-0.0318	-0.0315	-0.0315	-0.0809^a	-0.0808^a	-0.0804^a	-0.0803^a
	(-1.492)	(-1.492)	(-1.434)	(-1.434)	(-5.238)	(-5.239)	(-5.186)	(-5.187)
REL_SIZE	0.0167	0.0168	0.0159	0.0159	-0.0076	-0.0076	-0.0092	-0.0092
	(1.390)	(1.396)	(1.289)	(1.294)	(-0.760)	(-0.754)	(-0.928)	(-0.921)
DIFFIND	-0.0065	-0.0065	-0.0052	-0.0052	-0.0159	-0.0159	-0.0148	-0.0148
	(-0.537)	(-0.539)	(-0.423)	(-0.425)	(-1.512)	(-1.514)	(-1.409)	(-1.411)
Pct_STOCK	-0.0382^b	-0.0382^b	-0.0441^a	-0.0442^a	-0.0483^a	-0.0484^a	-0.0503^a	-0.0503^a
	(-2.386)	(-2.389)	(-2.713)	(-2.718)	(-3.392)	(-3.397)	(-3.555)	(-3.560)
Constant	0.0089	0.0093	0.0602	0.0608	-0.0141	-0.0136	-0.0150	-0.0144
	(0.097)	(0.102)	(0.636)	(0.642)	(-0.189)	(-0.181)	(-0.192)	(-0.186)
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,170	2,170	2,170	2,170	2,168	2,168	2,168	2,168
Adj. R^2	0.196	0.196	0.183	0.183	0.158	0.158	0.159	0.158

This table presents the results from the regression of the target's M&A announcement cumulative abnormal returns (*Tgt_22dCAR1*, *Tgt_22dCAR2, Tgt_3dCAR1* or *Tgt_3dCar2*) on target insider net purchase ratios (*NIP* or *NVIP*). The variables are defined in Appendix A. *Industry Fixed* denotes "target" industry fixed effects. Standard errors are clustered within the "target" firm. T-statistics are in parentheses. Superscripts a, b, and c indicate the significance of parameter estimates at the 1, 5, and 10 % (two-sided) significance levels, respectively.

TABLE 7. Effect of target insider net purchases on acquisition payment method

	Pct_STOCK (OLS) (1)	Pct_STOCK (OLS) (2)	CASH (Logit) (3)	CASH (Logit) (4)
NIP	-0.0372^a		0.2580^a	
	(-3.088)		(2.729)	
NVIP		-0.0373^a		0.2591^a
		(-3.105)		(2.747)
Acq_SIZE	-0.0636^a	-0.0636^a	0.3460^a	0.3470^a
	(-8.301)	(-8.306)	(5.822)	(5.823)
Acq_MTB	0.0055^a	0.0055^a	-0.0396^b	-0.0396^b
	(2.784)	(2.780)	(-2.119)	(-2.115)
Acq_LEV	-0.0287	-0.0285	0.0390	0.0375
	(-0.544)	(-0.540)	(0.098)	(0.095)
Acq_FCF	-0.2260^b	-0.2271^b	3.1140^a	3.1160^a
	(-2.298)	(-2.305)	(3.076)	(3.078)
Acq_ROA	-0.1140	-0.1130	0.6870	0.6830
	(-1.242)	(-1.236)	(0.712)	(0.706)
Tgt_ROA	-0.1681^a	-0.1682^a	1.1953^b	1.1974^b
	(-3.083)	(-3.088)	(2.538)	(2.542)
Tgt_SIZE	0.0704^a	0.0706^a	-0.3744^a	-0.3742^a
	(7.814)	(7.818)	(-5.755)	(-5.755)
Tgt_BLOCK	0.0183	0.0182	-0.0100	-0.2640
	(0.514)	(0.511)	(-1.004)	(-1.001)
Tgt_MTB	0.0099^a	0.0098^a	-0.0439^b	-0.0438^b
	(4.576)	(4.574)	(-2.460)	(-2.457)
Tgt_LEV	-0.1973^a	-0.1970^a	-0.6513^c	-0.6512^c
	(-4.397)	(-4.395)	(-1.896)	(-1.895)
Tgt_RUN-UP	0.0268^b	0.0269^b	-0.0068	-0.0076
	(1.987)	(1.996)	(-0.064)	(-0.071)
Tgt_EP	0.0242	0.0242	0.0814	0.0813
	(0.706)	(0.707)	(0.304)	(0.304)
TENDER	-0.4494^a	-0.4495^a	2.9712^a	2.9716^a
	(-23.550)	(-23.556)	(15.732)	(15.730)
MULBIDDER	-0.0398	-0.0397	0.0759	0.0754
	(-1.332)	(-1.329)	(0.290)	(0.288)
REL_SIZE	-0.0885^a	-0.0889^a	0.2731^c	0.2730^c
	(-4.738)	(-4.743)	(1.737)	(1.737)
DIFFIND	0.0031	0.0030	0.0157	0.0162
	(0.175)	(0.172)	(0.124)	(0.128)
Prem1W	-0.0274	-0.0276	0.4443^a	0.4444^a
	(-1.258)	(-1.268)	(2.621)	(2.622)
Constant	0.9160^a	0.9161^a	-1.8370^c	-1.8371^c
	(5.824)	(5.827)	(-1.767)	(-1.769)
Year Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
N	2,189	2,189	2,182	2,182
Adj. (/Pseudo) R^2	0.382	0.382	0.3501	0.3501

This table presents the results from the OLS regression of the percentage of stock or logistic regression of the cash indicator on target insider net purchase ratios (*NIP* or *NVIP*). The variables are defined in Appendix A. *Industry Fixed* denotes acquirer industry fixed effects. Standard errors are clustered within the acquirer firm. T(Z)-statistics are in parentheses in models 1 and 2 (3 and 4). Superscripts a, b, and c indicate the significance of parameter estimates at the 1, 5, and 10 % (two-sided) significance levels, respectively.

TABLE 8. Alternative aggregation period for target insider trading: (-365, -181) and (-180, -1) days before the M&A announcement date

	Com1_CAR2		Δ3yrAdjROA		Prem4W		Tgt_22dCAR2		CASH	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: (-180, -1)-day aggregation window										
NIP(-180, -1)	0.0079[b]		0.0068		0.0351[b]		0.0327[a]		0.2403[b]	
	(2.225)		(1.611)		(1.962)		(2.824)		(1.993)	
NVIP(-180, -1)		0.0080[b]		0.0066		0.0342[c]		0.0325[a]		0.2407[b]
		(2.233)		(1.582)		(1.943)		(2.801)		(2.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
N	2,248	2,248	1,344	1,344	2,045	2,045	2,170	2,170	2,182	2,182
Adj. (/Pseudo) R^2	0.2330	0.2330	0.059	0.060	0.1461	0.1460	0.2362	0.2361	0.3489	0.3490
Panel B: (-365, -181)-day aggregation window										
NIP(-365, -180)	0.0041		0.0120[a]		0.0377[b]		0.0240[b]		0.2280[b]	
	(1.510)		(2.672)		(2.277)		(2.466)		(2.189)	
NVIP(-365, -180)		0.0042		0.0118[a]		0.0371[b]		0.0241[b]		0.2320[b]
		(1.551)		(2.639)		(2.222)		(2.475)		(2.227)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed	Yes(A)	Yes(A)	No	No	Yes(A)	Yes(A)	Yes(T)	Yes(T)	Yes(A)	Yes(A)
N	2,248	2,248	1,344	1,344	2,045	2,045	2,170	2,170	2,182	2,182
Adj. (/Pseudo) R^2	0.1911	0.1911	0.060	0.060	0.099	0.099	0.181	0.181	0.3491	0.3492

This table presents the results from replicating all previous tests with an alternative aggregation period (-365, -180) of insider trading before M&A announcement date. The variables are defined in Appendix A. *Industry Fixed* denotes acquirer (target) industry fixed effects except (in) models 7 and 8. Standard errors are clustered within the acquirer (target) firm except (in) models 7 and 8. T(Z)-statistics are in parentheses except (in) models 9 and 10. Superscripts a, b, and c indicate the significance of parameter estimates at the 1, 5, and 10 % (two-sided) significance levels, respectively.

TABLE 9. Green window trading period for target insider trading

	Com1_CAR2		Δ3yrAdjROA		Prem4W		Tgt_22dCAR2		CASH	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
NIP_GW	0.0042		0.0110[b]		0.0361[b]		0.0210[b]		0.1820[c]	
	(1.612)		(2.544)		(2.224)		(2.055)		(1.688)	
NVIP_GW		0.0044		0.0106[b]		0.0365[b]		0.0213[b]		0.1850[c]
		(1.631)		(2.450)		(2.260)		(2.088)		(1.711)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.0111	0.0109	0.00498	0.00513	0.2280[a]	0.2270[a]	0.0683	0.0681	-1.7781[c]	-1.7780[c]
	(0.680)	(0.670)	(0.289)	(0.297)	(2.633)	(2.630)	(0.721)	(0.720)	(-1.659)	(-1.659)
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes
N	2,248	2,248	1,344	1,344	2,045	2,045	2,170	2,170	2,182	2,182
Adj. (/Pseudo) R^2	0.1911	0.1911	0.059	0.059	0.099	0.099	0.180	0.180	0.3486	0.3486

This table presents the results from replicating all previous tests with an alternative insider trading period before M&A announcement date. We aggregate insider trades occurred within the one month (+1, +30) green window following each quarterly earnings announcements over the one-year period prior to the M&A announcement, and follow the same way described in section III.1 to calculate the green window net purchases volume (NIP_GW) and value ratios (NVIP_GW). Other variables are defined in Appendix A. *Industry Fixed* denotes acquirer (target) industry fixed effects except (in) models 7 and 8. Standard errors are clustered within the acquirer (target) firm except (in) models 7 and 8. T(Z)-statistics are in parentheses except (in) models 9 and 10. Superscripts a, b, and c indicate the significance of parameter estimates at the 1, 5, and 10 % (two-sided) significance levels, respectively.

TABLE 10. Instrumental Variable Approach

	Com1_CAR2		Prem4W		Tgt_22dCAR2		Pct_STOCK	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fitted_NIP	0.0209[a]		0.1440[a]		0.1010[a]		-0.1980[a]	
	(2.617)		(2.661)		(3.344)		(-5.578)	
Fitted_NVIP		0.0208[a]		0.1440[a]		0.0996[a]		-0.1980[a]
		(2.571)		(2.662)		(3.314)		(-5.575)
Acq_SIZE	-0.0086[a]	-0.0086[a]	0.0413[a]	0.0413[a]	0.0310[a]	0.0310[a]	-0.0605[a]	-0.0605[a]
	(-4.454)	(-4.462)	(4.009)	(4.008)	(5.008)	(5.002)	(-8.410)	(-8.414)
Acq_MTB	-0.026×10^{-3}	-0.026×10^{-3}	-0.0001[a]	-0.0001[a]	-0.0001[a]	-0.0001[a]	-0.024×10^{-3}	-0.024×10^{-3}
	(1.974)	(1.975)	(-3.161)	(-3.156)	(-5.193)	(-5.191)	(-1.062)	(-1.070)
Acq_LEV	0.0382[a]	0.0382[a]	0.0300	0.0292	-0.0160	-0.0163	-0.0275	-0.0264
	(2.809)	(2.803)	(0.336)	(0.345)	(-0.366)	(-0.374)	(-0.517)	(-0.496)
Acq_FCF	-0.0209	-0.0208	-0.1481	-0.1480	-0.0825	-0.0820	-0.1230	-0.1240
	(-0.564)	(-0.562)	(-1.039)	(-1.036)	(-1.064)	(-1.058)	(-1.287)	(-1.296)
Acq_ROA	0.0267	0.0266	0.1231	0.1230	0.1330[c]	0.1320[c]	-0.0432	-0.0420
	(0.703)	(0.700)	(0.989)	(0.981)	(1.897)	(1.888)	(-0.846)	(-0.824)
Tgt_ROA	-0.0096	-0.0097	-0.0346	-0.0342	-0.0550	-0.0552	-0.0980[b]	-0.0982[b]
	(-1.000)	(-1.008)	(-0.389)	(-0.384)	(-0.905)	(-0.908)	(-2.269)	(-2.267)
Tgt_SIZE	0.0053[b]	0.0053[b]	-0.0520[a]	-0.0521[a]	-0.0343[a]	-0.0344[a]	0.0521[a]	0.0521[a]
	(2.466)	(2.460)	(-4.682)	(-4.689)	(-4.342)	(-4.349)	(5.986)	(5.995)
Tgt_BLOCK	0.0038	0.0037	-0.0649	-0.0648	-0.0408	-0.0408	0.0342	0.0341
	(0.442)	(0.438)	(-1.542)	(-1.537)	(-1.468)	(-1.470)	(0.953)	(0.950)
Tgt_MTB	0.034×10^{-3}	0.033×10^{-3}	-0.049×10^{-3}	-0.049×10^{-3}	-0.006×10^{-3}	-0.007×10^{-3}	-0.0006[a]	-0.0006[a]
	(1.188)	(1.173)	(0.377)	(0.378)	(-0.0389)	(-0.0452)	(-4.986)	(-4.988)
Tgt_LEV	-0.0190	-0.0189	0.0359	0.0356	0.0388	0.0389	-0.1291[a]	-0.1290[a]
	(-1.444)	(-1.436)	(0.569)	(0.564)	(0.858)	(0.860)	(-2.943)	(-2.935)
Tgt_RUN-UP	-0.0062[b]	-0.0062[b]	-0.0425[b]	-0.0425[b]	-0.0715[a]	-0.0715[a]	0.0365[a]	0.0365[a]
	(-2.205)	(-2.203)	(-2.567)	(-2.569)	(-4.991)	(-4.991)	(4.493)	(4.499)
Tgt_EP			-0.0247	-0.0247	-0.0033	-0.0033	-0.0095	-0.0095
			(-0.881)	(-0.882)	(-0.908)	(-0.909)	(-0.480)	(-0.480)
Tgt_SGROW			-0.0863[c]	0.0862[c]	-0.0688[b]	-0.0688[b]		

56

			(-1.680)	(-1.678)	(-2.173)	(-2.172)		
Tgt_TANG			-0.0389	-0.0386	0.0459	0.0463		
			(-0.567)	(-0.562)	(1.006)	(1.016)		
Tgt_LIQ			0.1240^c	0.1240^c	0.1380^a	0.1381^a		
			(1.961)	(1.961)	(3.071)	(3.067)		
TENDER	0.0154^a	0.0154^a	0.0814^a	0.0815^a	0.1100^a	0.1101^a	-0.4610^a	-0.4620^a
	(3.136)	(3.137)	(3.103)	(3.109)	(5.502)	(5.505)	(23.202)	(23.218)
MULBIDDER	-0.0056	-0.0056	0.1950^a	0.1950^a	-0.0302	-0.0302	-0.0370	-0.0370
	(-0.809)	(-0.808)	(4.466)	(4.466)	(-1.266)	(-1.266)	(-1.195)	(-1.194)
REL_SIZE	0.0259^a	0.0259^a	0.0476^a	0.0476^a	0.0045	0.0045	-0.0614^a	-0.0613^a
	(4.559)	(4.557)	(2.593)	(2.592)	(0.536)	(0.533)	(-4.539)	(-4.536)
DIFFIND	-0.0010	-0.0009	0.0048	0.0050	0.0006	0.0007	0.0043	0.0041
	(-0.231)	(-0.224)	(0.204)	(0.211)	(0.0365)	(0.0441)	(0.241)	(0.228)
Pct_STOCK	-0.0311^a	-0.0311^a	0.0213	0.0214	-0.0372^c	-0.0373^c		
	(-5.930)	(-5.936)	(0.647)	(0.651)	(-1.781)	(-1.784)		
Prem1W							-0.0269	-0.0269
							(-1.229)	(-1.228)
Constant	0.0235	0.0237	0.2621^b	0.2620^b	0.0254	0.0258	0.9160^a	0.9150^a
	(1.139)	(1.150)	(2.550)	(2.548)	(0.245)	(0.249)	(5.752)	(5.751)
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,103	2,103	2,045	2,045	2,170	2,170	2,050	2,050
Adj. R^2	0.166	0.166	0.074	0.074	0.145	0.145	0.394	0.394

This table presents the second-stage regression results from replicating all previous tests by using *Fitted_NIP* (and *Fitted_NVIP,*) which are the fitted value of *NIP* (and *NVIP*) obtained from the first stage regression explained in the Section V.3. Other variables are defined in Appendix A. *Industry Fixed* denotes acquirer (target) industry fixed effects except (in) models 5 and 6. Standard errors are heteroscedasticity-adjusted in all models and clustered within the acquirer (target) firm except (in) models 5 and 6. T-statistics are in parentheses. Superscripts a, b, and c indicate the significance of parameter estimates at the 1, 5, and 10 % (two-sided) significance levels, respectively.

TABLE 11. Cross-sectional extension: Target firm information environment

	Com1 CAR2		Prem4W		Tgt 22dCAR2		Pct STOCK	
Panel A: Market Value	**(1) Large**	**(2) Small**	**(3) Large**	**(4) Small**	**(5) Large**	**(6) Small**	**(7) Large**	**(8) Small**
NIP	0.0034	0.0153[a]	-0.0087	0.0837[a]	0.0069	0.0605[a]	-0.0272[c]	-0.0588[a]
	(0.848)	(3.395)	(-0.474)	(2.768)	(0.555)	(3.360)	(-1.698)	(-2.761)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	993	979	1,022	1,021	1,020	1,016	1,022	1,021
Adj. R^2	0.210	0.135	0.175	0.027	0.182	0.194	0.465	0.351
NVIP	0.0035	0.0156[a]	-0.0096	0.0774[b]	0.0060	0.0544[a]	-0.0275	-0.0587[a]
	(0.881)	(3.348)	(-0.525)	(2.556)	(0.487)	(2.971)	(-1.707)	(-2.775)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	993	979	1,022	1,021	1,020	1,016	1,022	1,021
Adj. R^2	0.210	0.135	0.175	0.026	0.182	0.192	0.465	0.351
Panel B: BA-spread	**(9) Low**	**(10) High**	**(11) Low**	**(12) High**	**(13) Low**	**(14) High**	**(15) Low**	**(16) High**
NIP	0.0050	0.0086[b]	-0.0013	0.0989[a]	0.0222[c]	0.0580[a]	-0.0276	-0.0406[b]
	(1.237)	(2.039)	(-0.0689)	(3.260)	(1.755)	(3.292)	(-1.637)	(-2.018)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	994	978	1,019	1,019	1,019	1,017	1,019	1,019
Adj. R^2	0.217	0.134	0.159	0.053	0.217	0.164	0.424	0.386
NVIP	0.0052	0.0089[b]	-0.0079	0.0994[a]	0.0154	0.0585[a]	-0.0271	-0.0413[b]
	(1.265)	(2.118)	(-0.407)	(3.295)	(1.223)	(3.327)	(-1.601)	(-2.150)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	994	978	1,019	1,019	1,019	1,017	1,019	1,019
Adj. R^2	0.217	0.134	0.159	0.053	0.215	0.164	0.424	0.386

This table reports cross-sectional test results. The subsamples are constructed on the market value in Panel A and on the bid-ask spreads in Panel B; the subsample constructions are described in Section V.4. The variables are defined in Appendix A. *Industry Fixed* denotes acquirer (target) industry fixed effects except (in) models 5-6 and 13-14. Standard errors are clustered within the acquirer (target) firm except (in) models 5-6 and 13-14. T-statistics are in parentheses. Superscripts a, b, and c indicate the significance of parameter estimates at the 1, 5, and 10 % (two-sided) significance levels, respectively.

TABLE 12. Opportunistic (abnormal) target insider trading

	Com1_CAR2		Prem4W		Tgt_22dCAR2		Pct_STOCK	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
NIP_Opp	0.0069[b]		0.0392[b]		0.0280[a]		-0.0288[a]	
	(2.256)		(2.177)		(2.665)		(-2.024)	
NVIP_Opp		0.0070[b]		0.0389[b]		0.0275[a]		-0.0292[a]
		(2.273)		(2.158)		(2.617)		(-2.048)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,248	2,248	2,045	2,045	2,170	2,170	2,189	2,189
Adj. R^2	0.193	0.193	0.099	0.099	0.187	0.187	0.380	0.380

This table presents the results from replicating previous tests with opportunistic (abnormal) insider trades only after dropping routine trades. Following Cohen et al. (2012), a routine trader is defined as an insider who places a trade in the same calendar month for at least three consecutive years while opportunistic traders are defined as those who are not routine traders and for whom we cannot detect an obvious discernible pattern in timing of their trades. Other variables are defined in Appendix A. *Industry Fixed* denotes acquirer (target) industry fixed effects except (in) models 5 and 6. Standard errors are clustered within the acquirer (target) firm except (in) models 5 and 6. T-statistics are in parentheses. Superscripts a, b, and c indicate the significance of parameter estimates at the 1, 5, and 10 % (two-sided) significance levels, respectively.