

# Stock price informativeness on the sensitivity of strategic M&A investment to Q

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**Abstract** Using a strategic merger sample that covers the period from 1985 to 2011, we find that the acquirer's stock price firm-specific information, the new information created by investors about the value of firm fundamentals, increases the positive sensitivity of strategic merger investment to the acquirer's Q; the target's stock price firm-specific information increases the negative sensitivity of merger investment to the target's Q. These results suggest that managers learn from financial markets in identifying strategic merger investment opportunities by transferring assets from poorly managed firms to well managed firms. In addition, the target's stock price firm-specific information itself increases the acquisition size, indicating that informed acquirer managers are more likely to take out large merger investment. Last but not the least, stock price informativeness increases merger synergies and post-merger performance, suggesting that informed managers make better merger investment that increases shareholder value. Our study contributes to the recent increasing stream of studies on managerial learning from the market.

**Keywords** Stock price informativeness · Strategic M&A investment · Managers learn from the market · Tobin's Q

**JEL Classification** G34 · G14

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## 1 Introduction

Traditionally, the neoclassical merger theory assumes that managers possess all information about the firm's growth opportunities and initiate M&A deals to acquire assets from the target with low growth opportunities (Jovanovic and Rousseau 2002; Andrade and Stafford 2004). Recognizing that investors also acquire and use firm-specific information, a stream of recent studies presents evidence that managers do not possess all information about the value of firm fundamentals. Investors, because of their professional expertise and unique talents, can collect, analyze, and interpret firm-related information, and create their own private firm-specific information.<sup>1</sup> Informed investors trade on their private firm-specific information so that this information is impounded into stock prices as stock price firm-specific information (Roll 1988).<sup>2</sup> Through the channel of stock prices, investors' private firm-specific information is conveyed to managers. A series of studies on internal capital investment find that stock price firm-specific information increases the sensitivity of capital investment to Tobin's Q, the stock market valuation of growth opportunities, suggesting that managers learn from the market (Chen et al. 2007; Foucault and Frésard 2012, 2014; Edmans and Jayaraman 2016). Furthermore, these studies find that stock price informativeness increases capital investment efficiency.

Previous studies examine investment through internal capital expenditure only. Investment through mergers and acquisitions (M&A) are also important decisions that managers make to facilitate firms' expansion to achieve growth (Mitchell and Mulherin 1996; Bittlingmayer 1996; Harford 2005; Maksimovic et al. 2011; Bena and Li 2014). Studies show that merger investment is related to the acquirer's growth opportunities measured by Tobin's Q (Jovanovic and Rousseau 2002; Andrade and Stafford 2004; Klasa and Stegemoller 2007). In addition, merger investment is different from capital investment in that it purchases used assets from the target firm, whose growth opportunities also matter for the combined firm. Merger synergies are created by transferring assets from targets with low growth opportunities (low Q) to acquirers with high growth opportunities (high Q) (Lang et al. 1989; Servaes 1991). Other studies argue that acquirers purchase growth from innovative target firms to achieve synergies (Sevilir and Tian 2012; Phillips and Zhdanov 2013; Bena and Li 2014). If managers learn from the market, we expect stock price informativeness to affect the sensitivity of merger investment to both acquirer and target firms' Qs. Another difference between internal capital investment and merger investment is that the acquirer needs to evaluate the target's assets. The target's stock price firm-specific information by itself may increase the M&A investment because it reduces acquirer managers' information disadvantage of the target's valuation (Hansen 1987). Last but not the least, if stock price firm-specific information provides managers new information about firms' fundamental value, merger investment should be more aligned with the value of firm fundamentals. We expect that stock price informativeness will increase the post-merger shareholder value and firm performance.

Our sample includes 1994 strategic majority M&A deals announced during the period from 1985 to 2011. We define strategic majority M&A deals as those that have at least \$10 million deal value and the acquirer seeks majority control of the target. These merger

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<sup>1</sup> Chen et al. (2007) suggest that "This information is more likely to be about the demand for the firm's products or about strategic issues, such as competition with other firms" [p. 620]. De Cesari and Huang-Meier (2015) argue that this information can be about the demand for the firm's products, especially that in investors' own country market that a multinational firm investing in such country may not possess.

<sup>2</sup> We use stock price firm-specific information and stock price informativeness interchangeably.

decisions may significantly affect corporate strategies and shareholder value. Our main measure of stock price firm-specific information is stock return non-synchronicity calculated from the market model regression controlling for the industry return during the 1-year period before merger announcement.<sup>3</sup> Our results show that the acquirer's stock price firm-specific information increases the positive sensitivity of merger investment to the acquirer's  $Q$ , while the target's stock price firm-specific information increases the negative sensitivity of merger investment to the target's  $Q$ . Combined with the argument of the neoclassical merger theory that M&A facilitates asset transfer from low growth firms (low  $Q$ ) to high growth firms (high  $Q$ ), these evidence suggest that stock price informativeness increases the sensitivity of merger investment to firms' fundamentals. In addition, the target's stock price firm-specific information directly increases the size of merger investment, suggesting that more information about the target's valuation encourages acquirer managers to make large investment through strategic M&A deals.

Additional tests show that these relations are robust to multiple alternative measures of stock price informativeness. Furthermore, we find that these relations do not change when we substitute  $Q$  with its long-term growth component following Rhodes-Kropf et al. (2005), suggesting that managers' learning from financial markets is about the value of firm fundamentals but not market frenzy. The supplemental tests on the acquirer firm's characteristics show that equity dependency, institutional ownership, institutional investors' turnover rate, analyst following, or firm diversification cannot fully explain the main results. Furthermore, our main results are not driven by the market expectation effect (Cai et al. 2011). Last but not the least, the stock price firm-specific information increases the merger announcement return and post-merger operating performance, supporting the argument that informed merger investment is more likely to increase shareholder value.

Our study contributes to the literature that managers learn from the market in making corporate decisions. Previous studies find that managers learn from the market in capital investment (Chen et al. 2007; Foucault and Gehrig 2008; Foucault and Frésard 2012, 2014; Edmans and Jayaraman 2016), cash savings (Frésard 2012; Kusnadi 2015), dividend payment (De Cesari and Huang-Meier 2015), seasoned equity issuance (Jegadeesh et al. 1993; Giammarino et al. 2004), and labor investment (Ben-Nasr and Alshwer 2015). This paper extends these studies by showing that managers also learn from the market in strategic merger investment. Two recent papers find that managers learn from the market in merger completion decisions (Kau et al. 2008; Luo 2005). Different from these studies, we focus on managerial learning from the market before a merger is announced.

Our study also contributes to the neoclassical M&A theory. Previous studies find that mergers can be initiated with different purposes, such as to achieve growth opportunities (Jovanovic and Rousseau 2002), to take advantage of overvalued equity (Shleifer and Vishny 2003), or to increase managers' personal interests (Jensen 1986). By studying the relation between stock price informativeness and the sensitivity of merger investment to  $Q$ , this paper provides new evidence supporting the pursuit of growth argument. Our results suggest that the quality of the measure of growth opportunities plays an important role in M&A decisions and shareholder wealth. Since M&A transactions do not significantly create value for shareholders (Loughran and Vijh 1997; Moeller et al. 2005), our study has the policy implication that increase the information efficiency of financial markets may benefit shareholders' wealth.

<sup>3</sup> This measure has been used by previous studies such as Wurgler (2000), Durnev et al. (2004), Jin and Myers (2006), Ferreira and Laux (2007), Foucault and Gehrig (2008), Frésard (2012), Foucault and Frésard (2014), Kim et al. (2014), and Kusnadi (2015).

The remainder of the paper is organized as follows. Section 2 summarizes related literatures and develop hypotheses. Section 3 presents the measure of stock price firm-specific information and the sample selection process. Section 4 explains our research methodology, main tests, and robustness tests and discussions. And Sect. 5 concludes.

## 2 Literature review and hypotheses development

### 2.1 Stock price firm-specific information and capital investment

The investment theory proposed by Tobin (1969) argues that the rate of investment is a function of  $Q$ , the ratio of the market value of new additional investment goods to their replacement cost. Investment should increase when stock prices are high and decrease when stock prices are low. Stock prices are formed through investors' trading on financial markets. Investors, because of their professional expertise and unique talents, can collect, analyze, and interpret firm-related information, and create their own private firm-specific information. Informed investors trade on their private firm-specific information when the benefit of trading on that information is greater than the cost of collecting and analyzing that information (Grossman and Stiglitz 1980). Through informed trading, investor's private firm-specific information is impounded into stock price as stock price firm-specific information (Roll 1988; Wang and Yang 2015). When stock price firm-specific information is higher, managers have more accurate measures of investment opportunities so that their investment decisions are more efficient.

At the country level, Wurgler (2000) compares the investment efficiency in 65 countries and 28 industries over the period from 1963 to 1995. He shows that investment efficiency increases when stock prices exhibit less synchronicity. Since stock price synchronicity is inversely related to the amount of firm-specific information impounded in stock prices (Morck et al. 2000), Wurgler (2000) indicates that stock price firm-specific information improves investment efficiency. At the industry level, Durnev et al. (2004) find that the industry value-weighted stock price informativeness is positively related to industry investment efficiency. The authors argue that this may be because more informative stock prices provide managers more accurate information regarding the quality of investment decisions. At the firm level, Chen et al. (2007) show that stock price firm-specific information improves firms' operating performance, suggesting that a more accurate measure of  $Q$  helps managers to take greater advantage of growth opportunities.

The first direct evidence that stock price firm-specific information provides managers new information about investment opportunities lies in the finding that it increases the sensitivity of capital investment to  $Q$  (Chen et al. 2007). Since firm-specific information known by managers would not affect investment and thus will decrease the investment-to- $Q$  sensitivity, the authors claim that managers learn new information about the value of firm fundamentals and growth opportunities from financial markets. This information can be about strategic issues, such as competition with other firms (Chen et al. 2007), or about the demand for the firm's products, especially that in investors' own country market that a multinational firm investing in such country may not possess (De Cesari and Huang-Meier 2015).

Also testing the investment-to- $Q$  sensitivity, Foucault and Frésard (2012) report that firms cross-listed in the United States have a higher investment-to- $Q$  sensitivity than non-cross-listed firms. Since cross-listing increases the number of informed traders and thus the

precision of stock price firm-specific information (Foucault and Gehrig 2008; Fernandes and Ferreira 2008), the authors argue that more informative stock prices after cross-listing facilitate managerial learning from the market. Foucault and Frésard (2014) find that industry peers' stock price informativeness increases the sensitivity of the firm's capital investment to the peers' Q. Managers, therefore, do not only learn from their own stock prices but also their industry peers' stock prices. Edmans and Jayaraman (2016) find that the investment-to-Q sensitivity increases when the Revelatory Price Efficiency ("RPE"), the amount of information not already possessed by the decision maker, increases after the enforcement of the insider trading laws. The authors argue that only new information from stock prices matters to the investment-to-Q sensitivity.

## 2.2 Merger investment and growth opportunities

Similar to internal capital investment, merger investment is also a function of the firm's future growth opportunities. Mitchell and Mulherin (1996) find that extensive takeover and restructuring activity in the 1980s are triggered by industry shocks. In the 1980s and 1990s, Harford (2005) find that industry merger waves are driven by economic, regulatory and technological shocks that cause abnormally large absolute changes in most of the economic characteristics. Bittlingmayer (1996) finds that industries with greater internal capital investment also have higher rates of merger, suggesting that internal capital investment and merger respond to the same factors. Using plant-level data, Maksimovic et al. (2011) find that acquirers restructure targets in ways to exploit their competitive advantage. Bena and Li (2014) argue that merger synergies obtained from combining merging firms' innovation capacities are important drivers of acquisition.

Using Tobin's Q as a proxy for the value of future growth opportunities, studies show that merger investment increases with Q. Jovanovic and Rousseau (2002) theoretically demonstrate that both merger investment and internal capital investment increase with Tobin's Q. Furthermore, because of higher fixed cost associated with merger investment, firms with higher Q choose merger investment. In empirical studies, Andrade and Stafford (2004) argue that both direct capital investment and merger investment increase the firm's asset base and/or productive capacity, and therefore, both of them will respond similarly to external incentives. Their empirical study shows that both merger investment and internal capital investment increase with Q. Klasa and Stegemoller (2007) find that takeover sequences begin subsequent to an increase in industry Q and comes to an end when the industry Q significantly decreases, suggesting that takeover sequences are driven by growth opportunities.

Different from making internal capital investment, the acquirer purchases used capital from the target that are already put together by the target management. The quality of target management also matters for deal construction. Lang et al. (1989) find that the target's Q is usually lower than that of the acquirer in tender offers. As management's performance is a major determinant of Q, the authors argue that tender offers are initiated when poorly managed assets are transferred to better management. Servaes (1991) reports similar results when including not only tender offers but also negotiated M&A deals in the sample. Studying plant level asset sales through M&A, Maksimovic and Phillips (2001) find that assets are more likely sold by less productive firms to firms with higher productivity. Therefore, to the contrary of the acquirer, the merger activities are negatively related to the target's Q.

In some cases, however, the target's growth potential is important for the combined firm's future growth. Sevilir and Tian (2012) show that post-merger innovation activities

are positively associated with the target's pre-merger R&D intensity and innovation outcome. Phillips and Zhdanov (2013) argue that in an active acquisition market, small firms have the incentive to innovate in order to get acquired by a large firm. Bena and Li (2014) find that the target and the acquirer pursue related R&D activities prior to the merger, which contribute to the combined merger synergy. Overall, these studies suggest that acquirers purchase growth through M&A investment.

### 2.3 Hypotheses development

As the neoclassical merger theories state, merger investment is positively associated with the acquirer's growth opportunities (Jovanovic and Rousseau 2002; Andrade and Stafford 2004). When stock prices include more information about the value of firm fundamentals that managers do not know, a higher Q informs managers a larger amount of positive information about future growth opportunities. If managers use this information in deciding on strategic merger investment, they are more likely to make a larger merger deal. On the other hand, a lower Q more likely suggests poor growth prospects that discourage managers in taking out large investment through strategic M&A.

**Hypothesis one** The acquirer's stock price firm-specific information will increase the positive sensitivity of strategic M&A investment to the acquirer's Q.

Acquirers may also initiate M&A deals to purchase growth from innovative target firms (Sevilir and Tian 2012; Phillips and Zhdanov 2013; Bena and Li 2014). If the target firm's stock prices are more informative, acquirer managers can more accurately assess the value of the target's future growth opportunities. On the other hand, less informative target stock prices may cause acquirer managers question that high market valuation is driven by misvaluation and thus disregard this information.

**Hypothesis two** The target's stock price firm-specific information will increase the positive sensitivity of strategic M&A investment to the target's Q.

Neoclassical merger theories argue that merger synergies are created when relatively poorly managed assets in the target firm are transferred to the acquirer (Lang et al. 1989; Servaes 1991). When the target's stock prices are more informative, lower Q serves as a clearer signal of poorly managed assets and thus informs acquirer managers to acquire these assets. On the other hand, higher Q of the target firm is more likely to deter acquirer firms from purchasing the assets.

**Hypothesis three** The target's stock price firm-specific information will increase the negative sensitivity of strategic M&A investment to the target's Q.

No matter whether the acquirer is seeking to purchase poorly managed assets or future growth from the target firm, it has to go through a costly search process for the best matched assets. When the target's stock prices are more informative of the firm's fundamental value, the acquirer benefits from decreased searching cost, which may encourage acquirer managers to take out large investment through strategic M&A.

**Hypothesis four** The target's stock price firm-specific information itself will increase the strategic M&A investment.

Both the acquirer and the target firms' growth opportunities matter for the combined firm, and merger deals exhibit an assortative matching between the quality of merging firms' assets (Rhodes-Kropf and Robinson 2008). When stock prices are informative of the

value of firm fundamentals, managers are more likely to find the best match that create higher shareholder value.

**Hypothesis five** The merging firms' stock price firm-specific information will increase shareholder value in strategic M&A.

### 3 Data and sample selection

We start the sample collection process from the Securities Data Company's (SDC) U.S. Mergers and Acquisitions Database. The merger announcement period is from 1985 to 2011. Panel A in Table 1 lists detailed number of observations after each sample selection criterion. We require that (1) both firms are U.S. domestic and the deal type is "Disclosed Dollar Value" mergers and acquisitions; (2) both merging firms have "public" status; (3) deal status is either complete or withdrawn; (4) the deal value is at least \$10 million;<sup>4</sup> (5) acquirer has less than 50% ownership before the deal and seeks majority control of the target; (6) the target firm is not bankrupt; (7) total percentage of cash, stock, and other payment adds up to 99.99 to 100.01%; (8) both merging firms are not in the financial industry (SIC codes 6000-6999) or the regulated utility industry (SIC codes 4900-4999). After all these steps, we collected 3036 major acquisitions.

The strategic M&A investment is defined as deal value scaled by the acquirer's book value of assets the last fiscal year before merger announcement. Stock price firm-specific information is measured with stock return non-synchronicity. It equals  $\log\left[\frac{1 - R^2}{R^2}\right]$ , where  $R^2$  is from the market model regressions controlling for industry value-weighted return as shown in specification (1). We define each industry by the Fama–French 12 industry classification.

$$R_{it} - R_{ft} = \alpha + \beta \times (R_{mt} - R_{ft}) + \delta \times (R_{jt} - R_{ft}) + \varepsilon_{it} \quad (1)$$

where  $R_{it}$  is firm  $i$ 's daily stock return,  $R_{ft}$  is the daily risk-free return measured by the one-month Treasury bill rate,  $R_{mt}$  is the daily market value-weighted return on all NYSE, AMEX, and NASDAQ stocks (from CRSP), and  $R_{jt}$  is the daily value-weighted return of the Fama–French 12 industries. We use daily stock returns during the period  $(-295, -43)$  trading days before deal announcement to run the models. We require that there be at least 100 daily stock return observations. The period stops at 43 trading days before deal announcement, as studies find that merger-related information is leaked to the market about two months before deal announcement (Schwert 1996). In the absence of firm-specific information, stock returns vary only because of factors related to industry and markets returns. If firm-specific information affects stock returns, it will render returns to deviate from market and industry returns. Therefore, when stock price is more informative of firm-specific factors, the individual stock return becomes less correlated with the market and industry returns and stock return non-synchronicity is lower. Similar measures of stock price firm-specific information are employed by Wurgler (2000), Durnev et al. (2004), Jin and Myers (2006), Ferreira and Laux (2007), Foucault and Gehrig (2008), Foucault and Frésard (2014), Kim et al. (2014), and De Cesari and Huang-Meier (2015). Our measure is

<sup>4</sup> Because our focus is strategic merger investment, we use a stricter criterion than some M&A studies (Moeller et al., 2005; Harford, Humphery-Jenner, and Powell, 2012), where \$1 million is the threshold. Our criterion is consistent with studies such as Dong, Hirshleifer, Richardson, and Teoh (2006) and Rhodes-Kropf et al. (2005).

**Table 1** Sample selection and descriptive statistics

Sample selection criteria							No. of obs.
<i>Panel A: Sample selection process</i>							
Both merging firms are domestic, and the transaction is “Disclosed Dollar Value” M&A						66,619	
Acquirer’s status is “public”						41,880	
Target’s status is “public”						7660	
Deal status is either “complete” or “withdrawn”						7364	
Deal value is at least \$10 million						6697	
Acquirer has <50% ownership before the deal and seeks majority control of the target						6422	
Target is not bankrupt						6344	
Total percentage of cash, stock, and other payment adds up to 99.99–100.01%						5729	
Target firms are not in the financial industry (SIC codes 6000-6999) and the regulated utility industry (SIC codes 4900-4999)						3314	
Acquirer firms are not in the financial industry (SIC codes 6000-6999) and the regulated utility industry (SIC codes 4900-4999)						3036	
Both merging firms have the stock return non-synchronicity measure						2531	
Both merging firms have the managerial inside information measure						2301	
Both merging firms have accounting variables						1994	
Variable	N	Mean	P25	Median	P75	SD	
<i>Panel B: Descriptive statistics</i>							
Merger_Invnt	1994	0.76	0.10	0.31	0.83	1.24	
Acq_ψ	1994	1.68	0.66	1.50	2.48	1.42	
Tgt_ψ	1994	3.18	2.03	3.04	4.20	1.61	
Acq_AI	1994	5.36	2.88	4.46	6.88	3.51	
Tgt_AI	1994	6.95	3.76	5.88	9.14	4.41	
Acq_Size	1994	13.07	0.48	1.99	8.44	31.56	
Tgt_Size	1994	1.07	0.08	0.22	0.80	2.55	
Rel_Size	1994	0.33	0.05	0.16	0.44	0.42	
Acq_Q	1994	2.56	1.43	1.95	2.94	1.87	
Tgt_Q	1994	2.11	1.18	1.58	2.40	1.61	
Acq_CF	1994	0.19	0.03	0.11	0.29	0.20	
Tgt_CF	1994	0.23	0.03	0.14	0.39	0.24	
Acq_LEV	1994	0.29	0.13	0.27	0.43	0.20	
Tgt_LEV	1994	0.34	0.14	0.32	0.51	0.23	
Stock	1994	0.37	0.00	0.00	1.00	0.48	
Friendly	1994	0.92	1.00	1.00	1.00	0.28	
Complete	1994	0.84	1.00	1.00	1.00	0.37	
ARET	1994	-0.01	-0.12	-0.02	0.09	0.19	
TRET	1994	0.33	0.11	0.30	0.51	0.37	
CRET	1994	0.03	-0.08	0.02	0.14	0.20	
ROA_CHG	1741	0.74	-1.24	-0.03	0.69	16.98	



**Table 1** continued

Variable	N	Mean	P25	Median	P75	SD
SLS_CHG	1746	0.14	0.02	0.10	0.20	0.21

The sample includes 1994 strategic M&A deals announced from 1985 to 2011. Panel A reports sample selection process and number of observations after each criterion. Panel B reports the statistics of main variables. Detailed descriptions of each variable and data source are provided in “Appendix”. All continuous variables are winsorized at 1 and 99%

also similar to  $(1-R^2)$  in Chen et al. (2007). The log transformation can better address the bounded nature of  $R^2$ . Using CRSP stock return database, we obtain 2531 merger observations with both merging firms’ stock return non-synchronicity before deal announcement.

We collect accounting variables from the annual COMPUSTAT industrial files. Tobin’s Q is calculated as the market value of equity plus book value of assets minus book value of equity scaled by book value of assets, all measured at the last fiscal year before merger announcement. As mergers can be initiated by managerial private information of over-valued equity (Shleifer and Vishny 2003; Jensen 2005), we control for managerial private information measured with earnings’ surprise (Chen et al. 2007). This variable is defined as the average of absolute abnormal return  $(-1, +1)$  around previous four quarterly earnings announcements before deal announcement. A positive absolute earnings’ surprise reveals that there is some information in earnings not fully anticipated by the market and hence are not impounded into prices yet. Because managers know allegedly the accounting numbers beforehand, the earnings’ surprise can be a reasonable measure of managerial private information. We control for firm size since it is negatively related to the measure of stock return synchronicity and large firms are more likely to have resources to manage large acquisitions. We also include controls of firm leverage and cash holdings. From an agency perspective, leverage has a monitoring effect on managerial decisions; on the other hand, higher leverage may lead to sub-optimal decisions (Myers 1977; Harrison et al. 2014). Cash holdings if often associated with over-investment and worse merger performance (Jensen 1986; Oler and Waagelein 2011). Deal characteristics such as stock payment, friendly deal, and tender offer are also included following the literature on mergers and acquisitions. Overall, we get 1944 merger observations that have information of these control variables for both merging firms. Therefore, our final sample includes 1994 domestic U.S.-majority acquisitions announced during the period from 1985 to 2011.

Table 1 shows the descriptive statistics of major variables used in this study. All continuous variables are winsorized at 1 and 99%. The size of strategic M&A has the mean of 78% and the median of 31%, suggesting that these merger investment decisions are important strategic corporate decisions. The mean and median acquirer’s stock return non-synchronicity are 1.68 and 1.50, respectively. Since idiosyncratic risk equals  $\ln\left(\frac{1-R_i^2}{R_i^2}\right)$ , these numbers suggest that the mean and median  $R^2$  of the acquirer’s pre-merger daily stock return are about 15 and 18%, which are comparable to an average firm’s  $R^2$  of 17% in Chen et al. (2007) and Roll (1988), suggesting that a large amount of stock price movements are driven by firm-specific information. The target stock return non-synchronicity has a mean and median of 3.18 and 3.04, respectively. The target firm has significantly higher stock return non-synchronicity than the acquirer. The target also has

higher measures of managerial inside information than the acquirer. These observations are mainly because both stock return non-synchronicity and the absolute earnings announcement abnormal return are negatively related with firm size. In our multivariate regressions, we include firm size as the control variable. The average (median) of the acquirer's pre-merger quarterly earnings announcement abnormal return is 5.36% (4.46%), comparable to that in Chen et al. (2007). The average and median relative size of the merger is 33 and 16%, respectively.<sup>5</sup> The average Tobin's Q for the acquirer and the target are 2.56 and 1.95, respectively. Merger wealth creation is measured by announcement returns and post-merger operating performance for completed mergers. The average and median combined merger returns are statistically positive while those for the acquirer are statistically negative, indicating that merger investment creates value that is mainly accrued to target shareholders. The average of post-merger ROA growth and sales growth are 74 and 14% respectively, suggesting that merger investment overall increases firm performance.

## 4 Stock price informativeness and the sensitivity of strategic M&A investment to Q

### 4.1 Basic tests

Our basic tests are based on the following regression model.

$$\begin{aligned} \text{Merger\_Size}_{i,t} = & \alpha + \beta_1 \text{Acq\_Q}_{i,t-1} + \beta_2 \text{Acq\_}\psi_{i,t-1} \times \text{Acq\_Q}_{i,t-1} + \beta_3 \text{Acq\_}\psi_{i,t-1} \\ & + \beta_4 \text{Tgt\_Q}_{i,t-1} + \beta_5 \text{Tgt\_}\psi_{i,t-1} \times \text{Tgt\_Q}_{i,t-1} + \beta_6 \text{Tgt\_}\psi_{i,t-1} + \text{CONTROL} + \varepsilon_{it} \end{aligned} \quad (2)$$

$\text{Merger\_Size}_{i,t}$  is acquirer firm  $i$ 's merger investment at an announced strategic M&A deal.  $\text{Acq\_Q}_{i,t-1}$  ( $\text{Tgt\_Q}_{i,t-1}$ ) is the acquirer's (target's) Tobin's Q measured at the last fiscal year before merger announcement.  $\text{Acq\_}\psi_{i,t-1}$  ( $\text{Tgt\_}\psi_{i,t-1}$ ) is the acquirer's (target's) pre-merger stock price firm-specific information. CONTROL is a set of control variables that we mentioned before. In every regression, we include year and industry fixed effects because mergers cluster through time by industry (Andrade and Stafford 2004). All continuous variables are winsorized at 1 and 99% to eliminate outliers. The  $p$  values are calculated based on heteroskedasticity-robust standard errors adjusted for bidder clustering.

Table 2 summarizes the regression results from specification (2). Column (1) shows that the size of the strategic M&A is positively associated with the acquirer's Q, consistent with the arguments of Jovanovic and Rousseau (2002), Andrade and Stafford (2004), and Klasa and Stegemoller (2007). Column (2) shows that the coefficient of the interaction of  $\text{Acq\_}\psi$  and  $\text{Acq\_Q}$  is estimated at 0.102 with  $p$  value less than 0.01. Managers' merger investment decisions become more sensitive to the acquirer's Q when the acquirer's stock prices are more informative of its firm-specific information. In addition to the statistical significance, we also examine economic significance. Given that the 25th percentile value of  $\text{Acq\_}\psi$  is 0.66 and the median value is 1.50 (Table 1, Panel B), this estimate indicates that the merger-investment-to-Q sensitivity for a firm with a 25th percentile value of  $\text{Acq\_}\psi$  is 0.130 [= 0.216 - (1.50 - 0.66) \* 0.102]. This sensitivity will increase by 0.186 (143%), if

<sup>5</sup> In the robustness tests, we show that the main results still hold when strategic M&A investment is defined by relative size.

**Table 2** Price informativeness and the strategic merger investment sensitivity to Q

	(1)	(2)	(3)	(4)	(5)
Acq_Q	0.340*** (0.000)	0.216*** (0.000)			0.161*** (0.000)
Acq_ψ × Acq_Q		0.102*** (0.000)			0.117*** (0.000)
Acq_ψ		-0.195*** (0.000)			-0.230*** (0.000)
Tgt_Q			0.085*** (0.001)	0.211*** (0.000)	0.157*** (0.002)
Tgt_ψ × Tgt_Q				-0.050*** (0.001)	-0.043*** (0.002)
Tgt_ψ				0.082*** (0.008)	0.079*** (0.006)
Acq_Size	-0.235*** (0.000)	-0.216*** (0.000)			-0.421*** (0.000)
Tgt_Size			0.233*** (0.000)	0.227*** (0.000)	0.414*** (0.000)
Acq_CF	0.061 (0.788)	-0.037 (0.871)			-0.170 (0.406)
Acq_LEV	0.077 (0.659)	0.224 (0.218)			0.020 (0.899)
Tgt_CF			0.194 (0.188)	0.184 (0.223)	0.117 (0.385)
Tgt_LEV			-0.316*** (0.005)	-0.350*** (0.004)	-0.298*** (0.006)
Stock	0.087 (0.140)	0.101 (0.101)	0.195*** (0.001)	0.203*** (0.001)	-0.074 (0.151)
Friendly	-0.550*** (0.000)	-0.608*** (0.000)	-0.394*** (0.000)	-0.438*** (0.000)	-0.242** (0.012)
Tender	-0.168*** (0.000)	-0.187*** (0.000)	-0.158*** (0.001)	-0.170*** (0.001)	-0.085* (0.063)
Constant	2.483*** (0.000)	2.592*** (0.000)	-0.260 (0.252)	-0.295 (0.374)	1.350*** (0.000)
N	1994	1994	1994	1994	1994
Within R <sup>2</sup>	0.176	0.2116	0.2545	0.2665	0.4182
Adjusted R <sup>2</sup>	0.3139	0.3510	0.1554	0.1644	0.5418

This table reports GLS regression estimates of strategic M&A investment (Merger\_Invt). The sample period is from 1985 to 2011. Detailed descriptions of all variables and data sources are provided in “Appendix”. All continuous variables are winsorized at 1 and 99%. In every regression, we control for industry and year fixed effects. Numbers in parentheses are *p* values based on the heteroskedasticity-robust standard errors adjusted for bidder clustering

\*, \*\*, and \*\*\* denote statistical significance at 10, 5, and 1% levels, respectively

an acquirer's stock return non-synchronicity increases from a 25th percentile value to a 75th percentile value of 2.48. Therefore, both statistically and economically, the results support Hypothesis One that the acquirer's stock price firm-specific information significantly increases the sensitivity of strategic M&A investment to the acquirer's Q.

Columns (3) and (4) show estimation results of merger investment on the target's Q and its stock price firm-specific information. The coefficient of Tgt\_Q is positive and statistically significant. This is intuitive as the measure of merger investment is scaled deal value, which is positively related to the target's market valuation. The interaction of Tgt\_ψ and Tgt\_Q has a negative coefficient of  $-0.05$  with the  $p$  value of  $<0.01$ . Informative target stock prices inform acquirer managers that the high target's Q more likely reflects its fundamental value, and thus deters the acquirer's merger investment decisions. This result supports Hypothesis Three that informative target stock prices increase the negative sensitivity of strategic M&A investment to the target's Q. Further economic significance analysis shows that the sensitivity will decrease by 68% if the target's stock return non-synchronicity increases from a 25th percentile value to a 75th percentile value.<sup>6</sup> Regarding Hypothesis Four, we find that the target's stock price firm-specific information itself significantly increases the size of strategic M&A investment, suggesting that new information about the target fundamentals encourages acquirer managers to make large merger investment.

Columns (5) combines acquirer and target firms' stock price firm-specific information in the regression model. We find consistent results with previous columns. Overall, the basic multivariate regression results in Table 2 suggest that managers learn from the market in deciding on the size of investment through strategic M&A.

## 4.2 Robustness tests: quintile subsample results

In the following sections, we conduct robustness tests to strengthen the argument of managers learning from the market. First, we address the concern that the coefficient estimates for  $Acq\_ψ \times Acq\_Q$  and  $Tgt\_ψ \times Tgt\_Q$  are driven by extreme observations of the information measure. To do this, we sort the sample into quintiles based on stock return non-synchronicity and test whether the relation between merger investment and Q changes across these quintiles. This method can also appraise the economic magnitude of the effect of price informativeness on the sensitivity of merger investment to Q.

Panel A in Table 3 displays the results of merger investment on  $Acq\_Q$  in quintiles of  $Acq\_ψ$ . Quintile 1 includes acquirers with the least informative stock prices (lowest  $Acq\_ψ$ ), and quintile 5 includes those with the most informative stock prices (highest  $Acq\_ψ$ ). We observe that the sensitivity of merger investment to  $Acq\_Q$  is lowest in quintile 1 (coefficient on Q is 0.136 with a  $p$  value  $<0.10$ ) and highest in quintile 5 (coefficient on Q is 0.664 with a  $p$  value  $<0.01$ ). The observation that the sensitivity of merger investment to  $Acq\_Q$  increases almost monotonically along the quintiles of the  $Acq\_ψ$  suggests that our previous observation on  $Acq\_ψ$  is not driven by extreme values of  $Acq\_ψ$ . In addition, we find that the impact of  $Acq\_ψ$  is economically significant. While a one standard deviation increase in Q (1.87) is associated with a 25.43% ( $1.87 * 0.136$ ) increase in merger investment for firms with the least informative stock prices, merger investment increases by 124% ( $1.87 * 0.664$ ) when firms have the most informative stock prices.

<sup>6</sup>  $(4.20 - 2.03) \times 0.05 / [0.211 - (3.04 - 2.03) \times 0.05] = 0.68$ .

**Table 3** The strategic merger investment sensitivity to Q: by quintiles of stock price informativeness

	Q1	Q2	Q3	Q4	Q5
<i>Panel A: Quintiles by Acq_ψ</i>					
Acq_Q	0.136* (0.051)	0.392*** (0.000)	0.299*** (0.000)	0.517*** (0.000)	0.664*** (0.000)
Acq_Size	-0.116*** (0.000)	-0.204*** (0.000)	-0.234*** (0.000)	-0.255*** (0.000)	-0.363*** (0.000)
Acq_CF	0.243 (0.444)	0.500 (0.258)	0.523 (0.244)	-0.368 (0.429)	-0.326 (0.548)
Acq_LEV	0.112 (0.697)	0.514 (0.225)	0.841** (0.043)	0.668* (0.058)	0.154 (0.711)
Stock	0.168* (0.071)	-0.022 (0.886)	0.524*** (0.000)	-0.053 (0.711)	-0.087 (0.493)
Friendly	-0.501*** (0.001)	-0.324 (0.183)	-0.895*** (0.001)	-0.766*** (0.002)	-0.631** (0.021)
Tender	-0.073 (0.163)	-0.212** (0.040)	-0.132 (0.322)	-0.185 (0.160)	-0.004 (0.984)
Constant	0.000 (0.315)	0.000 (0.414)	1.923*** (0.000)	0.000 (0.355)	2.888** (0.012)
N	399	399	399	399	398
Within R <sup>2</sup>	0.2044	0.2773	0.0958	0.4616	0.5362
Adjusted R <sup>2</sup>	0.3012	0.3855	0.3743	0.3554	0.4294
<i>Panel B: Quintiles by Tgt_ψ</i>					
Tgt_Q	0.111* (0.066)	0.128** (0.011)	-0.030 (0.713)	0.026 (0.473)	-0.005 (0.856)
Tgt_Size	0.271*** (0.000)	0.253*** (0.000)	0.139** (0.025)	0.192*** (0.000)	0.057 (0.238)
Tgt_CF	-0.273 (0.463)	0.462 (0.242)	0.666 (0.127)	-0.160 (0.608)	-0.055 (0.847)
Tgt_LEV	-0.553 (0.136)	-0.110 (0.742)	-0.304 (0.295)	-0.426 (0.120)	-0.126 (0.527)
Stock	0.018 (0.904)	0.181 (0.248)	0.386** (0.029)	0.163** (0.040)	0.246** (0.012)
Friendly	-0.518** (0.049)	-0.913*** (0.009)	-0.144 (0.269)	-0.518 (0.124)	-0.005 (0.967)
Tender	-0.181 (0.353)	-0.350** (0.012)	-0.263*** (0.009)	0.012 (0.890)	-0.044 (0.480)
Constant	-0.255 (0.842)	-0.114 (0.893)	-0.164 (0.767)	-0.212 (0.673)	0.651 (0.106)
N	399	399	399	399	398
Within R <sup>2</sup>	0.4607	0.2532	0.2626	0.4703	0.7196

**Table 3** continued

	Q1	Q2	Q3	Q4	Q5
Adjusted R <sup>2</sup>	0.2535	0.2551	0.1888	0.1229	0.1048

This table reports GLS regression estimates of strategic M&A investment (Merger\_Invt). All observations are sorted in five subsamples depending on the quintile in which the stock price firm-specific information ( $\psi$ ) of the acquirer (Panel A) or the target (Panel B) falls during the year before merger announcement. The sample period is from 1985 to 2011. Detailed descriptions of all variables and data sources are provided in “Appendix”. All continuous variables are winsorized at 1 and 99%. In every regression, we control for industry and year fixed effects. Numbers in parentheses are  $p$  values based on the heteroskedasticity-robust standard errors adjusted for bidder clustering

\*, \*\*, and \*\*\* denote statistical significance at 10, 5, and 1% levels, respectively

Panel B in Table 3 shows that when the target has the most informative stock prices in quintile 1, merger investment increases with its  $Q$  (coefficient of 0.111 with  $p$  value of 0.066). This relation, however, becomes negative although not statistically significant when the target has lower informative stock prices in quintiles 3, 4, and 5. In addition, there is an approximate decreasing trend of the impact of the target’s  $Q$  on strategic merger investment along quintiles of  $Tgt\_ψ$ . Overall, Table 3 suggests that our previous observation in Table 2 is not driven by extreme value of  $Tgt\_ψ$ .

#### 4.3 Robustness tests: different classifications of strategic M&A investment

Next, we examine whether our main results still hold when using different criteria to define strategic M&A investment. According to the descriptive statistics in Panel B of Table 1, the 25th percentile of the relative size is about 5%, the median is about 15%, and the average is about 30%. Therefore, the first three columns report results using the screen of 5, 15, and 30% relative sizes, respectively. Similarly, we also use the 25th percentile, median, and mean of deal value to screen strategic M&A investment in the last three columns. The screening criterion of deal value in column (4) is at least \$100. It is \$200 and \$500 in columns (5) and (6), respectively. Table 4 shows that our main results are not sensitive to the screening criteria of strategic M&A investment. Acquirer stock price firm-specific information ( $Acq\_ψ$ ) consistently increases the sensitivity of merger investment to  $Q$  ( $Acq\_Q$ ). Meanwhile, we still observe that target stock price firm-specific information ( $Tgt\_ψ$ ) decreases the sensitivity of merger investment to  $Q$  ( $Tgt\_Q$ ), although this relation is not statistically significant in some of the regression models.

#### 4.4 Robustness tests: other measures of stock price informativeness

Another concern of our study is whether the main results are sensitive to the particular measure of stock price informativeness. We perform robustness checks with different measures employed in the literature. First, we change the market model that is used to calculate stock return non-synchronicity. In Column (1) of Table 5, the stock return non-synchronicity is calculated based on the market model regression including Fama–French three factors and the momentum factor as these factors are part of the systematic variation in individual returns (Fama and French 1993; Carhart 1997). In Column (2), the market model regression includes lagged market and industry returns to control for some market

**Table 4** The strategic merger investment sensitivity to Q: different classifications of strategic M&A investment

Strategic M&A screen	By relative size			By deal value		
	≥5% (1)	≥15% (2)	≥30% (3)	≥\$100 (4)	≥\$200 (5)	≥\$1000 (6)
Acq_Q	0.287*** (0.000)	0.469*** (0.000)	0.589*** (0.000)	0.181*** (0.000)	0.193*** (0.000)	0.240*** (0.000)
Acq_ψ × Acq_Q	0.097*** (0.000)	0.065*** (0.000)	0.048** (0.016)	0.146*** (0.000)	0.142*** (0.000)	0.186*** (0.000)
Acq_ψ	-0.212*** (0.000)	-0.115*** (0.006)	-0.059 (0.246)	-0.279*** (0.000)	-0.236*** (0.000)	-0.237** (0.029)
Tgt_Q	0.159*** (0.003)	0.043 (0.485)	0.063 (0.288)	0.159*** (0.003)	0.144** (0.015)	0.092 (0.189)
Tgt_ψ × Tgt_Q	-0.051*** (0.005)	-0.016 (0.438)	-0.021 (0.314)	-0.043** (0.019)	-0.048** (0.033)	-0.004 (0.913)
Tgt_ψ	0.092*** (0.007)	0.003 (0.940)	0.024 (0.629)	0.098** (0.011)	0.101** (0.047)	0.057 (0.448)
Acq_Size	-0.794*** (0.000)	-1.002*** (0.000)	-1.122*** (0.000)	-0.526*** (0.000)	-0.568*** (0.000)	-0.660*** (0.000)
Tgt_Size	0.794*** (0.000)	1.006*** (0.000)	1.137*** (0.000)	0.475*** (0.000)	0.496*** (0.000)	0.573*** (0.000)
Acq_CF	-0.111 (0.599)	-0.298 (0.285)	-0.194 (0.575)	-0.076 (0.790)	0.346 (0.300)	0.355 (0.386)
Acq_LEV	-0.139 (0.381)	-0.344* (0.091)	-0.420 (0.125)	-0.221 (0.286)	-0.412 (0.101)	-0.505 (0.108)
Tgt_CF	-0.352** (0.021)	-0.458** (0.016)	-0.509** (0.034)	0.052 (0.752)	0.003 (0.988)	0.043 (0.865)
Tgt_LEV	-0.724*** (0.000)	-0.903*** (0.000)	-1.148*** (0.000)	-0.299** (0.036)	-0.459*** (0.007)	-0.368 (0.140)
Stock	-0.073 (0.187)	-0.129* (0.065)	-0.139 (0.120)	-0.081 (0.207)	-0.142* (0.063)	-0.073 (0.442)
Friendly	-0.175* (0.054)	-0.172 (0.101)	-0.259** (0.035)	-0.249** (0.020)	-0.271** (0.026)	-0.253* (0.059)
Tender	0.031 (0.567)	0.055 (0.487)	0.045 (0.681)	-0.047 (0.404)	-0.089 (0.205)	-0.009 (0.926)
Constant	1.577*** (0.000)	1.561*** (0.000)	1.353*** (0.006)	1.750*** (0.000)	1.849*** (0.000)	2.136*** (0.001)
N	1495	993	674	1351	1025	418
Within R <sup>2</sup>	0.5941	0.6183	0.6519	0.4840	0.5033	0.5641

**Table 4** continued

Strategic M&A screen	By relative size			By deal value		
	≥5% (1)	≥15% (2)	≥30% (3)	≥\$100 (4)	≥\$200 (5)	≥\$1000 (6)
Adjusted R <sup>2</sup>	0.6546	0.6977	0.7346	0.5770	0.6031	0.7020

This table reports GLS regression estimates of strategic M&A investment (Merger\_Invt) when using different criteria to define strategic mergers. The first three columns report results using the screen of relative size at least 5, 15, and 30%, respectively. The last three columns report results using the screen of deal value at least \$100 million, \$200 million, and \$500 million, respectively. The sample period is from 1985 to 2011. Detailed descriptions of all variables and data sources are provided in “Appendix”. All continuous variables are winsorized at 1 and 99%. In every regression, we control for industry and year fixed effects. Numbers in parentheses are *p* values based on the heteroskedasticity-robust standard errors adjusted for bidder clustering \*, \*\*, and \*\*\* denote statistical significance at 10, 5, and 1% levels, respectively

and industry information that might find their way into prices with some delay. In Column (3), we follow Frésard (2012) to cumulate the returns in days where no trading took place to account for infrequent trading of daily frequency returns.<sup>7</sup> The calculated stock return non-synchronicity mitigates the potential bias created by the zeros in returns series.

In Column (4), we replace stock return non-synchronicity with the liquidity ratio (Illiq) suggested by Amihud (2002). This measure is computed as the annual average of the daily ratio between a stock’s absolute return and its dollar volume (multiplied by 10<sup>6</sup>) that captures the price impact of trades. The more informed trading on a stock, the higher is the price impact of trades (Kyle 1985). It is calculated using the following specification.

$$Illiq_{i,t} = \frac{1}{D_{i,t}} \sum_{\tau=1}^{D_{i,t}} \frac{|r_{i,\tau}|}{VOLD_{i,\tau}} \tag{3}$$

where  $D_{i,t}$  is the number of valid observation days during (−295, −43) trading days before deal announcement,  $r_{i,\tau}$  is firm *i*’s return on day  $\tau$ , and  $VOLD_{i,\tau}$  is the dollar trading volume of firm *i* on day  $\tau$ . Ferreira et al. (2011), and De Cesari and Huang-Meier (2015) also use this Illiq measure to proxy for the amount of private information embodied in stock prices.

In Column (5), the measure of stock price informativeness is Gamma, the private information trading measure suggested by Llorente et al. (2002). It is based on stock return autocorrelation conditional on trading volume. According to Llorente et al. (2002), in periods of high volume, stocks with a high degree of information-based trading tend to display more positive return autocorrelation. This trading-based variable is  $\phi_i$  estimated from the following specification. Higher values of the coefficient  $\phi_i$  on the interaction variable  $r_{it}V_{it}$  indicates more information-based trading (as opposed to noise or liquidity trading). It is calculated using the following specification.

$$r_{i,t} = \alpha_i + \gamma_i r_{i,t-1} + \phi_i r_{i,t-1} V_{i,t-1} + \beta_i r_{mt} + \varepsilon_{i,t} \tag{4}$$

where  $r_i$  is the firm’s daily returns,  $r_m$  is the market returns, and  $V_i$  is the logarithm of firm

<sup>7</sup> There are 51,911 (9%) “zero” daily returns for acquirer firms and 82,484 (14%) “zero” daily returns for target firms.



**Table 5** Price informativeness and the strategic merger investment sensitivity to Q: other measures of stock price informativeness

	(1) FF4	(2) Delay	(3) Cumulated	(4) Illiq	(5) Gamma	(6) PIN
Acq_Q	0.176*** (0.000)	0.165*** (0.000)	0.165*** (0.000)	0.293*** (0.000)	0.319*** (0.000)	-0.194 (0.116)
Acq_ψ × Acq_Q	0.131*** (0.000)	0.124*** (0.000)	0.118*** (0.000)	0.190*** (0.000)	0.409 (0.172)	2.626** (0.013)
Acq_ψ	-0.278*** (0.000)	-0.265*** (0.000)	-0.227*** (0.000)	-0.175** (0.017)	-1.092* (0.081)	-4.338** (0.024)
Tgt_Q	0.186*** (0.000)	0.172*** (0.000)	0.155*** (0.001)	0.032 (0.205)	0.027 (0.244)	0.026 (0.831)
Tgt_ψ × Tgt_Q	-0.068*** (0.000)	-0.055*** (0.000)	-0.044*** (0.002)	0.002 (0.699)	-0.336 (0.170)	-0.127 (0.834)
Tgt_ψ	0.127*** (0.001)	0.103*** (0.001)	0.080*** (0.003)	0.008 (0.190)	0.774 (0.137)	1.814 (0.115)
Acq_Size	-0.430*** (0.000)	-0.423*** (0.000)	-0.412*** (0.000)	-0.407*** (0.000)	-0.436*** (0.000)	-0.426*** (0.000)
Tgt_Size	0.413*** (0.000)	0.401*** (0.000)	0.400*** (0.000)	0.419*** (0.000)	0.404*** (0.000)	0.466*** (0.000)
Acq_CF	-0.164 (0.427)	-0.168 (0.380)	-0.166 (0.384)	-0.048 (0.810)	-0.131 (0.512)	0.157 (0.763)
Acq_LEV	0.007 (0.961)	0.044 (0.753)	0.024 (0.866)	-0.129 (0.374)	-0.128 (0.383)	-0.827*** (0.000)
Tgt_CF	0.099 (0.473)	0.096 (0.464)	0.097 (0.455)	0.147 (0.279)	0.108 (0.425)	-0.045 (0.925)
Tgt_LEV	-0.317*** (0.004)	-0.317*** (0.001)	-0.313*** (0.001)	-0.371*** (0.000)	-0.349*** (0.000)	-0.325* (0.096)
Stock	-0.076 (0.148)	-0.067 (0.161)	-0.064 (0.176)	-0.064 (0.175)	-0.070 (0.152)	-0.053 (0.484)
Friendly	-0.245** (0.012)	-0.210** (0.012)	-0.211** (0.011)	-0.196** (0.021)	-0.172** (0.041)	-0.137 (0.163)
Tender	-0.088* (0.059)	-0.068* (0.098)	-0.071* (0.080)	-0.072* (0.072)	-0.081* (0.054)	0.071 (0.371)
Constant	1.389*** (0.000)	1.356*** (0.000)	1.280*** (0.000)	1.085*** (0.000)	1.383*** (0.000)	1.621*** (0.000)
N	1994	1994	1994	1994	1994	422
Within R <sup>2</sup>	0.4093	0.4152	0.4162	0.3907	0.3769	0.5181
Adjusted R <sup>2</sup>	0.5364	0.5386	0.5389	0.5208	0.5030	0.5684

This table presents GLS regression estimates of strategic M&A investment (Merger\_Invt) when using other measures of stock price firm-specific information (ψ). The particular measure of ψ is listed on top of each column. The sample period is from 1985 to 2011. Detailed descriptions of all variables and data sources are provided in “Appendix”. All continuous variables are winsorized at 1 and 99%. In every regression, we control for industry and year fixed effects. Numbers in parentheses are *p* values based on the heteroskedasticity-robust standard errors adjusted for bidder clustering

\*, \*\*, and \*\*\* denote statistical significance at 10, 5, and 1% levels, respectively

i's daily turnover detrended by subtracting its 6-month moving average. The estimation period is  $(-295, -43)$  trading days before deal announcement and require that there be at least 100 return observations in the regression. This measure has also been used by Fernandes and Ferreira (2008) and De Cesari and Huang-Meier (2015) as a measure of stock price informativeness.

The last measure is the probability of informed trading (PIN). Easley et al. (2002) propose a market microstructure model, in which trades come from either noise traders or informed traders. Trades from noise traders come at the average rates of  $\varepsilon_b$  for buy orders and  $\varepsilon_s$  for sell orders. If an information event occurs, the arrival rate of informed traders is  $\mu$ . And the probability that such an information event occurs is  $\lambda$ . To maximize the likelihood function for a single trading day, the probability of informed trading PIN is given by specification (5) shown below.

$$PIN = \frac{\lambda\mu}{\lambda\mu + \varepsilon_b + \varepsilon_s} \quad (5)$$

A higher PIN measure indicates that a stock's orders more likely come from informed traders. The authors empirically estimate PIN for each NYSE-listed stock from 1983 to 1998. We get the PIN data from Søren Hvidkjaer's website.<sup>8</sup> Chen et al. (2007), Ferreira and Laux (2007), Ferreira et al. (2011), and De Cesari and Huang-Meier (2015) also employ this measure of stock price informativeness.

The results in Table 5 show that different measures of stock price informativeness do not significantly change our previous observation. The coefficients of  $Acq\_psi \times Acq\_Q$  keeps significantly positive in almost all alternative measures. The coefficients of  $Tgt\_psi \times Tgt\_Q$  and  $Tgt\_psi$  keep consistent in half of all alternative measures. Overall, the results show that the main results presented in Table 2 are not driven by a particular measure of stock price informativeness.

#### 4.5 Robustness tests: different components of Q

Another robustness test we use to strengthen our arguments is to examine different components of the market valuation. Rhodes-Kropf et al. (2005) split the market valuation into three components: the long-run multiples of price to book value (LRVTB) that proxies for growth opportunities, the firm-specific error (FSE), and the time-series sector error (TSSE). If stock price informativeness provides managers new information about the value of firm fundamentals and growth opportunities, we should observe stronger positive impact of stock price informativeness on the merger investment sensitivity to the LRVTB component of Q. On the contrary, if stock price informativeness reflects market misvaluation, we should observe stronger positive impact of stock price informativeness on the merger investment sensitivity to the misvaluation component of Q. We define Misvaluation as the sum of FSE and TSSE. We estimate LRVTB and Misvaluation following the 3rd model in Rhodes-Kropf et al. (2005) using the whole CRSP/COMPUSTAT dataset during the sample period.<sup>9</sup>

<sup>8</sup> Similar to De Cesari and Huang-Meier (2015), we significantly lose observations when matching PIN data.

<sup>9</sup> The difference between the three models in Rhodes-Kropf et al. (2005) lies in the control variables. The 1st model includes only book value of equity; the 2nd model includes both book value of equity and net income; the 3rd model also includes leverage ratio.

$$v(\theta_{i,t}; \alpha_{j,t}) = \alpha_{0j,t} + \alpha_{1j,t}b_{i,t} + \alpha_{2j,t} \ln(NI)_{i,t}^+ + \alpha_{3j,t}I_{(<0)} \ln(NI)_{i,t}^+ + \alpha_{4j,t}LEV_{i,t} + \varepsilon_{i,t} \quad (6)$$

NI is net income. We use absolute net income  $(NI)^+$  in the log function and use a dummy variable of negative net income  $(I_{(<0)})$  to address the cases of actual negative income. LEV is the market leverage  $(1 - \text{market equity}/\text{market value of assets})$ . In every fiscal year and Fama–French 12 industry, we run regression (6) to get the predicted market value based on the estimated coefficients. This predicted market value is  $v(\theta_{i,t}; \alpha_{j,t})$ . Then, in each Fama–French 12 industry, we average the coefficients in regression (6) over the entire sample period and calculate the predicted market value, which is  $v(\theta_{i,t}; \alpha_j)$ .

Table 6 presents estimation results when we use each component of Q to substitute Tobin's Q. Column (1) shows that  $Acq\_ψ$  increases the sensitivity of merger investment to the acquirer's LRVTB. It suggests that when the acquirer's stock prices are more informative, strategic M&A become more sensitive to the long-term growth component of Q. In Column (2), we include the acquirer's information asymmetry ( $Acq\_AI$ ) in the regression. We find that  $Acq\_AI$  does not affect the relation between merger investment and  $Acq\_LRVTB$ . This observation is intuitive that managerial inside information does not increase learning from the market.  $Acq\_ψ$  keeps the positive impact on the sensitivity of merger investment to  $Acq\_LRVTB$ , which provides robustness evidence that  $Acq\_ψ$  does not measure managerial private information but investors' private information about the value of firm fundamentals. Column (3) shows that  $Tgt\_ψ$  increases the negative sensitivity of merger investment to the target's LRVTB, suggesting that when target stock prices are more informative of its fundamental value, acquirer managers are more likely to purchase assets under poor management. In Column (4), the target's information asymmetry ( $Tgt\_AI$ ) does not affect the merger-investment-to-Q sensitivity, and the impact of  $Tgt\_ψ$  barely changes from that in Column (3). In Column (5), we combine both merging firms' information and LRVTB variables. The previous results stay robust. We also find that  $Tgt\_ψ$  significantly increases the size of strategic M&A investment, which supports previous observation. Overall, Table 6 provides additional supportive evidence that stock price firm-specific information keeps managers informative of firm fundamentals in making strategic merger investment decisions.

#### 4.6 Alternative explanations

Existing studies provide some arguments to explain the increased sensitivity of investment to the stock market valuation. In this section, we explore these arguments and test whether the positive impact of  $Acq\_ψ$  on the sensitivity of merger-investment-to-Q is mainly driven by factors other than stock price informativeness.

Baker et al. (2003) argue that corporate investment in an “equity-dependent” firm is more sensitive to the stock market valuation. That is, the “equity-dependent” firm is more likely to fund investment if it can issue overvalued equity. Obviously, this impact on investment-to-Q sensitivity is not because the market valuation reflects the marginal product of capital but because of market irrationality. Since the measure of stock price informativeness is positively associated to the measure of equity-dependency, we need to examine whether equity dependency drives our observed results on acquirer's stock price informativeness.

Similar to Chen et al. (2007), we use the KZ4 measure to proxy for the acquirer's equity dependency. Baker et al. (2003) develop the 4 variable version of the equity dependency measure proposed by Kaplan and Zingales (1997). The model of KZ4 is listed below.

**Table 6** Price informativeness and the strategic merger investment sensitivity to the long-term growth component of Q (LRVTB)

	(1)	(2)	(3)	(4)	(5)
Acq_ψ × Acq_LRVTB	0.078** (0.037)	0.075* (0.053)			0.110*** (0.002)
Acq_AI × Acq_LRVTB		0.016 (0.356)			
Acq_LRVTB	0.056 (0.504)	-0.026 (0.825)			-0.027 (0.743)
Acq_ψ	-0.041 (0.270)	-0.038 (0.302)			-0.064 (0.085)
Acq_AI		0.006 (0.700)			
Acq_Size	-0.129*** (0.000)	-0.120*** (0.000)			-0.347*** (0.000)
Acq_CF	0.621** (0.022)	0.558** (0.040)			0.302 (0.245)
Acq_LEV	-1.137*** (0.000)	-1.143*** (0.000)			-1.137*** (0.000)
Tgt_ψ × Tgt_LRVTB			-0.077*** (0.008)	-0.077*** (0.007)	-0.083*** (0.006)
Tgt_AI × Tgt_LRVTB				-0.007 (0.461)	
Tgt_LRVTB			0.303*** (0.007)	0.359*** (0.004)	0.339** (0.013)
Tgt_ψ			0.001 (0.949)	0.002 (0.925)	0.059** (0.027)
Tgt_AI				-0.001 (0.912)	
Tgt_Size			0.252*** (0.000)	0.251*** (0.000)	0.427*** (0.000)
Tgt_CF			0.283* (0.087)	0.283* (0.087)	0.420** (0.016)
Tgt_LEV			-0.553*** (0.000)	-0.570*** (0.000)	-0.441** (0.011)
Stock	0.304*** (0.000)	0.294*** (0.000)	0.178*** (0.005)	0.178*** (0.005)	0.054 (0.404)
Friendly	-0.661*** (0.000)	-0.663*** (0.000)	-0.413*** (0.001)	-0.412*** (0.001)	-0.254* (0.033)
Tender	-0.202*** (0.000)	-0.208*** (0.000)	-0.162*** (0.003)	-0.164*** (0.003)	-0.095 (0.092)
Constant	2.568*** (0.000)	2.519*** (0.000)	0.026 (0.941)	0.042 (0.906)	1.339*** (0.000)
N	1694	1694	1694	1694	1694
Within R <sup>2</sup>	0.1373	0.1394	0.2419	0.2417	0.3239

**Table 6** continued

	(1)	(2)	(3)	(4)	(5)
Adjusted R <sup>2</sup>	0.2212	0.2252	0.1508	0.1508	0.4101

This table presents GLS coefficient estimates of strategic M&A investment (Merger\_Invt). The sample period is from 1985 to 2011. Detailed descriptions of all variables and data sources are provided in “Appendix”. All continuous variables are winsorized at 1 and 99%. In every regression, we control for industry and year fixed effects. Numbers in parentheses are *p* values based on the heteroskedasticity-robust standard errors adjusted for bidder clustering

\*, \*\*, and \*\*\* denote statistical significance at 10, 5, and 1% levels, respectively

$$KZ4_{it} = -\frac{1.002CF_{it}}{A_{it-1}} - \frac{39.368DIV_{it}}{A_{it-1}} - \frac{1.315C_{it}}{A_{it-1}} + 3.139LEV_{it} \tag{7}$$

For an acquirer *i*,  $CF_{it}$  is the sum of earnings before extraordinary items and depreciation in the last fiscal year *t* before deal announcement,  $DIV_{it}$  is cash dividends,  $C_{it}$  is cash balances,  $LEV_{it}$  is the leverage ratio, and  $A_{it-1}$  is lagged assets. The higher the KZ4 measure, the more equity dependent the acquirer is. Table 7 shows the regression results when Acq\_var is defined on top of each column. Column (1) shows that acquirer’s KZ4 ratio does not significantly affect the strategic merger investment sensitivity to Acq\_Q, while  $Acq_{\psi} \times Acq_Q$  keeps significantly positive. Acquirer’s equity dependency, therefore, is not the main drive for our observed results.

Long-term institutional investors have the incentive to monitor the management and enhanced governance encourages informed trading as well as managerial propensity to learn from the market (Ferreira and Laux 2007; Kau et al. 2008). On the other hand, short-term investors increase stock price informativeness through informed trading while long-term investors do not (Yan and Zhang 2009), which suggests that long-term institutional investors’ ownership may hinder overall information production (Edmans and Manso 2011; Gaspar et al. 2005). To test whether institutional investors’ monitoring or informed trading explain our findings, we include the total institutional ownership and institutional investors’ turnover rate in the next two columns of Table 7, respectively. We use the Thomson-Reuters Institutional Holdings (13F) database and CRSP database for these measures. The institutional ownership is measured at the last quarter before merger announcement. Following Gaspar et al. (2005), we measure the turn-over rate as the weighted average of institutional investors’ total portfolio churn rate over (−6, −2) quarters before deal announcement. The specification is as follows.

$$\sum_{i \in S} w_{i,t} \left( \frac{1}{4} \sum_{r=1}^4 CR_{i,t-r-1} \right) \tag{8}$$

$w_{i,t}$  is the percentage shares held by institutional investor *i* at quarter *t*.  $CR_{i,t}$  is institutional investor *i*’s churn rate at quarter *t*.

$$CR_{i,t} = \frac{\sum_{j \in Q} |N_{j,t,t}P_{j,t} - N_{j,i,t-1}P_{j,t-1} - N_{j,i,t-1}\Delta P_{j,t}|}{\sum_{j \in Q} \frac{N_{j,i,t}P_{j,t} + N_{j,i,t-1}P_{j,t-1}}{2}},$$

where  $P_{j,t}$  and  $N_{j,i,t}$  represent the price and the number of shares, respectively, of company *j* held by investor *i* at quarter *t*.

Table 7 Price informativeness and the strategic merger investment sensitivity to Q: other related variables

	(1) KZ4	(2) Inst_own	(3) Churn	(4) Analyst	(5) HF_index	(6) Initial	(7) Non-initial
Acq_var × Acq_Q	-0.015 (0.264)	-0.249** (0.023)	1.667*** (0.000)	-0.055** (0.011)	0.155*** (0.008)		
Acq_ψ × Acq_Q	0.119*** (0.000)	0.092*** (0.000)	0.092*** (0.000)	0.083*** (0.000)	0.113*** (0.000)	0.163*** (0.000)	0.111*** (0.000)
Tgt_ψ × Tgt_Q	-0.041*** (0.003)	-0.035** (0.018)	-0.040*** (0.003)	-0.042*** (0.003)	-0.042*** (0.002)	-0.024 (0.463)	-0.051*** (0.001)
Tgt_ψ	0.076*** (0.007)	0.084*** (0.007)	0.073** (0.012)	0.081*** (0.005)	0.076*** (0.006)	0.035 (0.494)	0.103*** (0.007)
Acq_Q	0.135*** (0.001)	0.299*** (0.000)	-0.367*** (0.000)	0.342*** (0.000)	0.028 (0.606)	0.081 (0.247)	0.169*** (0.000)
Acq_ψ	-0.233*** (0.000)	-0.159*** (0.001)	-0.162*** (0.000)	-0.159*** (0.000)	-0.218*** (0.000)	-0.299*** (0.000)	-0.204*** (0.000)
Tgt_Q	0.149*** (0.002)	0.148*** (0.006)	0.139*** (0.004)	0.157*** (0.001)	0.153*** (0.002)	0.038 (0.729)	0.188*** (0.001)
Acq_var	0.048 (0.240)	0.628** (0.011)	-2.606*** (0.000)	0.106** (0.024)	-0.425*** (0.003)	-0.424*** (0.000)	-0.388*** (0.000)
Acq_Size	-0.418*** (0.000)	-0.390*** (0.000)	-0.378*** (0.000)	-0.414*** (0.000)	-0.421*** (0.000)	0.437*** (0.000)	0.389*** (0.000)
Tgt_Size	0.414*** (0.000)	0.398*** (0.000)	0.404*** (0.000)	0.411*** (0.000)	0.415*** (0.000)	-0.266 (0.443)	0.019 (0.937)
Acq_CF	-0.200 (0.318)	-0.084 (0.727)	-0.252 (0.251)	-0.190 (0.340)	-0.165 (0.423)	0.191 (0.378)	-0.094 (0.666)
Acq_LEV	-0.125 (0.509)	0.125 (0.506)	-0.232 (0.142)	0.036 (0.821)	-0.061 (0.692)	0.076 (0.713)	0.049 (0.765)

Table 7 continued

	(1) KZ4	(2) Inst_own	(3) Churn	(4) Analyst	(5) HF_index	(6) Initial	(7) Non-initial
Tgt_CF	0.140 (0.292)	0.187 (0.215)	0.144 (0.297)	0.101 (0.447)	0.128 (0.334)	-0.463** (0.016)	-0.324** (0.021)
Tgt_LEV	-0.300*** (0.005)	-0.250*** (0.035)	-0.272*** (0.012)	-0.297*** (0.006)	-0.284*** (0.009)	-0.121 (0.104)	-0.067 (0.361)
Stock	-0.073 (0.153)	-0.017 (0.782)	-0.062 (0.248)	-0.077 (0.132)	-0.073 (0.159)	-0.090 (0.414)	-0.445*** (0.006)
Friendly	-0.240** (0.012)	-0.151 (0.152)	-0.212** (0.024)	-0.250*** (0.008)	-0.241** (0.013)	-0.064 (0.369)	-0.139** (0.039)
Tender	-0.083* (0.068)	-0.088* (0.071)	-0.079* (0.091)	-0.087* (0.054)	-0.086* (0.061)	1.238*** (0.002)	2.094*** (0.010)
Constant	1.444*** (0.000)	0.371 (0.279)	1.846*** (0.000)	0.966*** (0.003)	1.683*** (0.000)	0.163*** (0.000)	0.111*** (0.000)
N	1994	1994	1994	1994	1994	810	1184
Within R <sup>2</sup>	0.4365	0.3767	0.3909	0.4908	0.4195	0.4259	0.4500
Adjusted R <sup>2</sup>	0.5482	0.5621	0.5484	0.5873	0.545	0.5258	0.5669

This table presents GLS coefficient estimates of strategic M&A investment (Merger\_Invt). The sample period is from 1985 to 2011. In columns (1) to (5), Acq\_var refers to the variable listed at the top of each column. Column (6) includes 810 strategic merger deals announced by initial bidders. An initial bidder is defined as the first bidder in a 4-digit SIC industry during a 1-year period. Column (7) includes 1,184 strategic merger deals announced by non-initial bidders. Detailed descriptions of all variables and data sources are provided in "Appendix". All continuous variables are winsorized at 1 and 99%. In every regression, we control for industry and year fixed effects. Numbers in parentheses are *p* values based on the heteroskedasticity-robust standard errors adjusted for bidder clustering

\*, \*\*, and \*\*\* denote statistical significance at 10, 5, and 1% levels, respectively

The estimates show that the acquirer's total institutional ownership has a negative effect on the merger-investment-to-Q sensitivity; institutional investors' turnover rate, however, increases the merger-investment-to-Q sensitivity. These results suggest that monitoring from institutional investors does not significantly encourages managerial learning from the market. Short-term institutional investors take advantage of their professional skills in creating new firm-specific information, which facilitates managerial learning. Meanwhile, we find that  $Acq\_ψ \times Acq\_Q$  keeps significantly positive. Institutional investors' monitoring or trading, therefore, cannot fully explain our findings.

Analyst coverage also affects both the governance of the management and a firm's information environment. Yu (2008) argues that analysts serve as external monitors for managerial earnings management. Chen et al. (2007) suggest that analyst coverage increases the information transfer from inside managers to the public but not the other way around. We include analyst coverage to test its impact on the sensitivity of merger-investment-to-Q. Using the I/B/E/S summary files, we measure analyst coverage as the log of number of analysts providing earnings forecasts in the previous year of merger announcement. The results show that analyst coverage decreases the sensitivity of merger investment to price. More importantly, the coefficient of  $Acq\_ψ \times Acq\_Q$  remains significantly positive.

Diversified firms can be harder to evaluate and thus managers are less likely to listen to the market. In Column (5), we use the Herfindahl index based on the acquirer's last year's sales in different business segments to proxy for the degree of its diversification. Lower Herfindahl index suggests higher diversification. We find that managers in less diversified firms are more responsive to  $Acq\_Q$ , suggesting that they may believe outside investors have more firm-specific information for less diversified firms. The coefficient of  $Acq\_ψ \times Acq\_Q$  remains significantly positive, suggesting that firm diversification does not attenuate our main findings.

Another explanation that can contribute to the positive coefficient of  $Acq\_ψ \times Acq\_Q$  is the market anticipation effect. Cai et al. (2011) document that in a certain industry subsequent bidders experience significantly positive abnormal returns around the initial bidder's merger announcement, suggesting that the market can anticipate future merger probabilities at industry peers' merger announcement. Cai et al. (2011) define an initial bidder as the first bidder in a 4-digit SIC industry during a 1-year period. Since our measure of stock return non-synchronicity and Q covers the 1-year period before merger announcement, it may capture the market expectation effect. That is, firms with higher probability of future merger investment may have higher stock return non-synchronicity and Q, which contributes to our main findings. To exclude the impact of the market anticipation effect, we run the main regression in the subsample of initial bidders. Following the definition of Cai et al. (2011), we find 810 initial bids in our sample. Column (6) in Table 7 shows that the coefficient of  $Acq\_ψ \times Acq\_Q$  is 0.163, statistically significant at 1%. For the group of 1184 subsequent bidders, Column (7) shows that the coefficient of  $Acq\_ψ \times Acq\_Q$  is 0.111, still significant at 1%. These two positive coefficients suggest that the market anticipation effect does not attenuate our main findings.

#### 4.7 Merger performance and stock price informativeness

Hypothesis Five argues that if stock price informativeness provides managers new information about the value of growth opportunities, it should improve merger synergies. In this section, we examine merger synergies with short-term merger announcement returns and long-term operating performance. Acquirer and target firms' announcement returns are



**Table 8** Price informativeness and the strategic merger performance

	(1) ARET	(2) TRET	(3) CRET	(4) ROA CHG	(5) ROA CHG	(6) SLS CHG	(7) SLS CHG
Acq_ψ	0.017*** (0.004)		0.011* (0.076)	1.081** (0.040)	0.842 (0.131)	0.025*** (0.000)	0.025*** (0.000)
Tgt_ψ		0.019*** (0.009)	0.007 (0.114)		-0.095 (0.810)		0.000 (0.916)
Acq_Q	-0.011** (0.037)		-0.007* (0.061)	-0.152 (0.643)	-0.111 (0.740)	0.011*** (0.006)	0.010** (0.013)
Tgt_Q		-0.031*** (0.000)	-0.014*** (0.000)	0.312 (0.322)	0.415 (0.203)	-0.003 (0.463)	-0.002 (0.628)
Acq_Size	0.001 (0.808)		-0.003 (0.532)	0.900** (0.027)	0.309 (0.479)	0.914 (0.521)	1.917 (0.196)
Acq_CF	-0.009 (0.802)		0.005 (0.881)	-4.048 (0.184)	-4.819 (0.126)	0.116*** (0.002)	0.125*** (0.001)
Acq_LEV	0.057 (0.128)		0.073* (0.060)	-1.417 (0.673)	-1.055 (0.761)	0.013 (0.755)	0.003 (0.953)
Tgt_Size		-0.015* (0.055)	0.009* (0.082)		0.006 (0.989)		-0.022 (0.955)
Tgt_CF		0.105* (0.052)	0.022 (0.436)	-3.511 (0.132)	-4.011* (0.096)	-0.003 (0.907)	-0.007 (0.794)
Tgt_LEV		0.113** (0.047)	-0.003 (0.928)	0.843 (0.738)	0.008 (0.998)	0.010 (0.734)	0.010 (0.734)
Rel_Size	-0.037** (0.012)	-0.090*** (0.000)		3.298*** (0.009)		0.055*** (0.000)	
Stock	0.002 (0.876)	-0.040** (0.039)	0.012 (0.348)	3.100*** (0.003)	2.844*** (0.009)	-0.007 (0.584)	-0.003 (0.813)
Friendly	0.005 (0.721)	0.015 (0.565)	-0.017 (0.352)	-5.413** (0.038)	-5.111* (0.061)	-0.043 (0.144)	-0.070** (0.023)
Tender	0.005 (0.635)	0.114*** (0.000)	0.014 (0.280)	1.448 (0.187)	1.176 (0.296)	-0.007 (0.580)	-0.011 (0.382)
Constant	-0.045 (0.371)	0.160 (0.116)	-0.014 (0.827)	-6.051 (0.299)	1.185 (0.849)	0.147*** (0.008)	0.197*** (0.001)
N	1994	1994	1994	1741	1741	1746	1746
Within R <sup>2</sup>	0.0408	0.1614	0.0376	0.0577	0.0552	0.1285	0.1276
Adjusted R <sup>2</sup>	0.0394	0.1584	0.0627	0.0489	0.0377	0.1316	0.1181

This table presents coefficient estimates of strategic merger performance. The dependent variable is listed at the top of each column. The sample period is from 1985 to 2011. Detailed descriptions of all variables and data sources are provided in “Appendix”. All continuous variables are winsorized at 1 and 99%. In every regression, we control for industry and year fixed effects. Numbers in parentheses are *p* values based on the heteroskedasticity-robust standard errors adjusted for bidder clustering

\*, \*\*, and \*\*\* denote statistical significance at 10, 5, and 1% levels, respectively

measured with the accumulated abnormal return during (-42, +7) trading days around the merger announcement. This period covers stock price run-up (Schwert 1996) and allows investor to fully analyze the announced strategic merger deal (Luo 2005). The market

model is estimated during a 1-year period until 43 trading days before the announcement. The combined merger announcement return is the acquirer and target firms' value-weighted announcement return, where the weights are their market capitalization at 43 trading days before the merger announcement. Following Harford (2005) and Chen et al. (2007), we use the average change in sales and ROA during a 3-year post-merger period to measure the combined firm's operating performance.

Since merger announcement return is related to firm and deal characteristics, control variables include cash holdings, leverage, firm size, merger attitudes, within-industry, and stock payment. These variables are demonstrated to be related to merger performance (Roll 1988; Jensen 1986; Moeller et al. 2005; Loughran and Vijh 1997; Devos et al. 2009; Myers and Majluf 1984; Rappaport 1990). Results in Table 8 show that the acquirer's stock price firm-specific information significantly increases acquirer announcement return, and the target's stock price firm-specific information significantly increases target announcement return. Combined merger announcement return also significantly increases with the acquirer's stock price informativeness and marginally so with the target's stock price informativeness ( $p$  value of 0.114). Next, we examine the impact of stock price informativeness in combined firms' long-term operating performance. We find that the post-merger ROA and sales are more likely to increase when the acquirer has higher stock price informativeness. The target's stock price informativeness, however, does not significantly affect the long-term operating performance. Overall, Table 8 presents supportive evidence that more informed managers make better investment decisions through strategic M&A deals.

## 5 Conclusions

This paper examines whether managers learn from financial markets in making merger investment decisions. In a sample of 1994 strategic M&A deals announced from 1985 to 2011, we find that the acquirer's stock price informativeness increases the positive merger investment sensitivity to  $Q$ , while the target's stock price informativeness increases the negative merger investment sensitivity to  $Q$ . Combined with the neoclassical merger theory, these evidence suggest that managers learn from the market to more accurately identify strategic merger investment opportunities where the acquirer with higher growth opportunities purchases the target with lower growth opportunities. The target's stock price firm-specific information also directly increases strategic merger investment, indicating that less information disadvantage in valuing the target firm encourages acquirer managers to make larger merger investment. Several robustness tests and supplemental tests present supportive evidence to these major findings. Managers' learning from the market increases shareholder value and post-merger operating performance.

The topic of managers learning from financial markets has attracted increased attention from academic research in recent years. This paper contributes to the increasing literature that managers not only learn from financial markets in making corporate decisions on capital investment (Chen et al. 2007; Foucault and Gehrig 2008; Foucault and Frésard 2012, 2014), cash savings (Kusnadi 2015), SEO offerings (Jegadeesh et al. 1993; Giammarino et al. 2004), and merger consummation (Luo 2005; Kau et al. 2008), but also do so in deciding on the size of strategic merger investment. Given the significance of strategic merger investment to shareholder value, this study highlights the importance of the financial market development to the real economy. This paper also contributes to the

merger literature that merger investment facilitates firms' expansion to achieve growth (Lang et al. 1989; Servaes 1991; Jovanovic and Rousseau 2002; Andrade and Stafford 2004). Different from previous neoclassical merger studies, we focus on stock price informativeness and show that this information helps managers to identify merger investment opportunities that transfer assets from poor management (low growth opportunities) to quality management (high growth opportunities).

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## Appendix: Variable definitions

Variable	Definition
Acq_AI (Tgt_AI)	Acquirer (target) firm's asymmetric information measured as the average of absolute abnormal return (−1, +1) around the previous four quarterly earnings announcements before deal announcement. Data source: COMPUSTAT, CRSP
Acq_CF (Tgt_CF)	Acquirer (target) firm's cash flow, defined as EBITDA (Compustat item 13) scaled by sales (Compustat item 12). Data source: COMPUSTAT
Acq_LEV (Tgt_LEV)	Acquirer (target) firm's book leverage the last fiscal year before deal announcement. It equals the sum of short- and long-term debt (Compustat items 34 and 9) and preferred stock (Compustat item 130) divided by book value of equity (Compustat item 60). Data source: COMPUSTAT
Acq_LRVTB (Tgt_LRVTB)	Acquirer's (Target's) long-run multiples of price to book value estimated following the 3rd model in Rhodes-Kropf et al. (2005) using the whole CRSP/COMPUSTAT dataset. Data source: COMPUSTAT, CRSP
Acq_Q (Tgt_Q)	Acquirer (target) firm's Tobin's Q measured at the last fiscal year before merger announcement. It equals market value of equity (Compustat item 199 times item 25) plus book value of preferred stock (Compustat item 130) and short- and long-term debt (Compustat items 34 and 9), scaled by the sum of book value of equity (Compustat item 60), book value of preferred stock (Compustat item 130), and short- and long-term debt (Compustat items 34 and 9). Data source: COMPUSTAT
Acq_size (Tgt_size)	Acquirer (target) firm's log transformed market value of assets (\$ billion) the last fiscal year before deal announcement. Data source: COMPUSTAT
Acq_ψ (Tgt_ψ)	Acquirer (target) firm's pre-merger stock return non-synchronicity, $\log [(1-R^2)/R^2]$ , where $R^2$ is from the market model regression controlling for the Fama–French 12 industry value-weighted returns. We use daily stock returns during (−295, −43) before deal announcement and require that there are at least 100 return observations in the regression. Data source: CRSP
Analyst	Analyst coverage, the log of number of analysts providing earnings forecasts in the previous year of merger announcement. Data source: I/B/E/S
ARET (TRET)	Acquirer (Target) abnormal return (−42, +7) at around merger announcement. The market model regression is estimated one year until 43 days before merger announcement. Data source: CRSP
Churn	The weighted average of institutional investors' total portfolio churn rate over (−6, −2) quarters before deal announcement. See details in Gaspar et al. (2005). Data source: CRSP

Variable	Definition
Complete	It equals one for completed mergers and zero otherwise. Data source: SDC
CRET	Combined abnormal return (-42, +7) at around merger announcement. The weights are acquirer and target firms' equity capitalization 43 days before deal announcement
Cumulated	Stock return synchronicity computed by cumulating the returns in days where no trading took place in the returns regressions. Data source: CRSP
Delay	Stock return synchronicity computed by including lagged market and industry returns in the returns regressions. Data source: CRSP
FF4	Stock return synchronicity computed by including Fama and French three factors and the momentum factor in the returns regressions. Data source: CRSP
Friendly	It equals one for friendly negotiated deals and zero otherwise. Data source: SDC
Gamm	Trading-based informativeness measure computed as in Llorente et al. (2002). Data source: CRSP
HF_index	Herfindahl index of the acquirer (target) firm's last year's sales in different business segments. Data source: COMPUSTAT
Illiq	Liquidity ratio calculated as in Amihud (2002). Data source: CRSP
Inst_own	Institutional ownership at the last quarter before merger announcement. Data source: Thomson-Reuters Institutional Holdings (13F)
KZ4	Four-variable KZ score following Baker et al. (2003). Data source: COMPUSTAT
Merger_Invt	Strategic M&A investment. It equals the announced deal value divided by the acquirer's book value of assets (COMPUSTAT item 6) the last fiscal year before merger announcement. Data source: SDC, COMPUSTAT
Misvaluation	The sum of the firm-specific error and the time-series sector error estimated following the 3rd model in Rhodes-Kropf et al. (2005) using the whole CRSP/COMPUSTAT dataset during the sample period. Data source: COMPUSTAT, CRSP
PIN	The probability of informed trading measure of Easley et al. (2002). Data source: Søren Hvidkjaer's website
Rel_Size	The percentage of deal value divided by the acquirer's market value of assets
ROA_CHG	Percentage of the average future 3-year growth rate of return-on-asset. Data source: COMPUSTAT
SLS_CHG	Percentage of the average future 3-year growth rate of sales. Data source: COMPUSTAT
Stock	Stock payment dummy, which equals one for all equity deals and zero otherwise. Data source: SDC
Tender	It equals one for tender offers and zero otherwise. Data source: SDC

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